Regular Town Council Meeting

October 20, 2025
6:00 PM
Town Council Chambers
Chair: Arne Jorgensen

NOTICE: THE VIDEO AND AUDIO FOR THIS MEETING ARE STREAMED TO THE PUBLIC VIA THE INTERNET AND MOBILE DEVICES WITH VIEWS THAT ENCOMPASS ALL AREAS, PARTICIPANTS AND AUDIENCE MEMBERS. PLEASE SILENCE ALL ELECTRONIC DEVICES DURING THE MEETING.

I. ZOOM LINK FOR PUBLIC PARTICIPATION

The Town reserves the right to close Public Comment via Zoom at any time. In-person comment will continue to be taken and written comments can always be submitted to Town Council by emailing electedofficials@jacksonwy.gov.

To join, click link or copy it to your browser: https://us02web.zoom.us/j/87932599478?pwd=EBVmNOdN3nadgySpMpTNOvxOVo0M2y.1

Or join at zoom.com with Webinar ID: **879 3259 9478** and Password: **83001** or by phone: **+1 669 900 9128**

II. OPENING

A. Call to Order and Roll Call

B. Pledge of Allegiance

C. Land Acknowledgement

D. Announcements/Proclamations

1. Introduction of Annette Langley, Development Coordinator

III. PUBLIC COMMENT

This section is reserved for public comment about items not included in this agenda. Public comment is limited to 3 minutes. As a general practice, Council does not discuss, debate, or act on issues raised under public comment. Council may or may not discuss an issue raised under Public Comment later in the meeting during Matters from Mayor and Council at their discretion. If you would like to communicate with Council during the meeting about an item on the agenda, please wait until public comment has been called for that item. Public comment may also be submitted to Council at any time by emailing *electedofficials@jacksonwy.gov*.

IV. CONSENT CALENDAR

All matters listed in this section are considered to be of routine nature by the governing body and will be enacted in one motion, unless it is removed from the consent calendar and considered separately by Council. Public comment may be given on any item.

A. Meeting Minutes

1. October 1, 2025 Special Town Council Meeting

B. Disbursements

C. September Municipal Court Report

D. Contracts

1. Contract with Valley Springs Ranch
2. Special Restrictions for Affordable Rental Housing at The Loop Apartments – West Building (Contracts A, B and C)
3. Primary Lease Agreement with Teton County (Adams Canyon Winter Employee Housing)

Please note that at any point during the meeting, the Mayor may change the order of items listed on this agenda. In order to ensure that you are present at the time your item of interest is discussed, please join the meeting at the beginning to hear any changes to the schedule or agenda.

4. Contract with Salt Lake Express
5. Termination of Original Revocable License for Chairlift Seating and Approval of a New Revocable License for Chairlift Seating-Home Ranch
6. Contract with Jackson Hole Public Art
7. Contract with Zift for Merchant Processing

E. Award Bid 26-03 for the Purchase of a New Electric Truck (Johnny Ziem)

F. Award Bid 26-04 for the Purchase of New Police Department Vehicles (Johnny Ziem)

G. 2025 Rodeo End of Season Report and 2026 Rodeo Dates (Roxanne Robinson)

V. POTENTIAL RECONSIDERATION

A. Potential Reconsideration of Millward/Simpson Garage Overnight Pricing (Tyler Sinclair)

VI. PUBLIC HEARINGS, DISCUSSION AND/OR POSSIBLE ACTION ITEMS

A. Administration
1. 90 Virginian Lane (Tyler Sinclair)
2. Municipal Court - Security Equipment and Associated Expenses (Tyler Sinclair)

B. Internal Services
1. Application for New Resort Hotel Liquor License for 930 Broadway Concession LLC at 930 W. Broadway Ave. (Lynsey Lenamond) - *This application was withdrawn by the applicant.*

C. Planning & Building
1. Boundary Adjustment at 564 and 570 E. Hansen Ave. (P25-155) (Katelyn Page)

D. Public Works
1. Award Bid 26-06 for the High School Rd. Pump House Project (Brian Lenz)

VII. ORDINANCES

A. Ordinance A: An Ordinance Adding Conflicts of Interest to Title 2 (Second Reading)

B. Ordinance B: An Ordinance Amending Title 15 Regarding International Residential Code (Third Reading, to be designated Ordinance 1446)

C. Ordinance C: An Ordinance Amending Title 15 Regarding Contractor Licensing and Certification (Third Reading, to be designated Ordinance 1447)

D. Ordinance D: An Ordinance Amending Title 12 Regarding Human Interment (Lea Colasuonno, First Reading)

VIII. MATTERS FROM MAYOR AND COUNCIL

A. Board and Commission Reports

B. Review of Federal Government Shutdown Letters 3 and 4

IX. MATTERS FROM THE TOWN MANAGER

A. Town Manager's Report

Please note that at any point during the meeting, the Mayor may change the order of items listed on this agenda. In order to ensure that you are present at the time your item of interest is discussed, please join the meeting at the beginning to hear any changes to the schedule or agenda.

X. ADJOURN

Please note that at any point during the meeting, the Mayor may change the order of items listed on this agenda. In order to ensure that you are present at the time your item of interest is discussed, please join the meeting at the beginning to hear any changes to the schedule or agenda.

Pledge of Allegiance

I pledge allegiance to the flag of the United States of America, and to the Republic for which it stands, one Nation under God, indivisible, with liberty and justice for all.

Land Acknowledgement

We recognize that the land we are gathering on is the ancestral homeland of the Mountain Shoshone People who stewarded it for thousands of years and that many other tribes also lived upon and cared for this area including the Bannock, Blackfoot, Crow, Eastern Shoshone, Gros Ventre, Nez Perce, Northern Arapaho tribes, and others. With gratitude, we honor Indigenous Peoples, past and present. We also acknowledge the sovereignty of the Native nations closest to Jackson whose land was taken through broken treaties that resulted in the creation of the Wind River and Fort Hall Indian Reservations. We recognize this acknowledgement is simply a first step. The Town of Jackson is committed to continued and informed action to connect with indigenous people.

Annette Langley – Development Coordinator

Annette Langley is excited to return as the new Development Coordinator in the Building Department with the Town of Jackson. She previously worked as the Planning Coordinator before she moved away to try her hand at gardening and dodging traffic in Indianapolis for a couple of years.

In her free time, Annette enjoys hiking, snow shoeing, and taking her dogs Gladys and Theo on adventures.

TOWN COUNCIL PROCEEDINGS - UNAPPROVED

OCTOBER 1, 2025 **JACKSON, WYOMING**

The Jackson Town Council met in a special meeting in the Town Hall Council Chambers, located at 150 East Pearl in Jackson, at 8:00 A.M. This meeting was held in-person and through the Zoom platform. Upon roll call the following were found to be present:

TOWN COUNCIL: Mayor Arne Jorgensen, Jonathan Schechter, and Alyson Spery. Devon Viehman and Kevin Regan were absent.

STAFF: Tyler Sinclair, Roxanne Robinson, Lea Colasuonno, Andrew Bowen, Russ Ruschill, Michelle Weber, Wanna Johansson, and Lynsey Lenamond.

Letter to Federal Delegation on Potential Federal Government Shutdown. Rick Howe from the Jackson Hole Chamber of Commerce made public comment**.** Council held discussion. A motion was made by Jonathan Schechter and seconded by Alyson Spery to approve the letter to the Wyoming Federal delegation regarding the federal government shutdown as discussed today, subject to minor changes by staff. Mayor Jorgensen called for the vote. The vote showed 2-1 with Mayor Jorgensen and Alyson Spery in favor and Jonathan Schechter opposed. The motion carried.

Adjourn. A motion was made by Jonathan Schechter and seconded by Alyson Spery to adjourn. Mayor Jorgensen called for the vote. The vote showed all in favor. The motion carried. The meeting adjourned at 8:42 a.m.

TOWN OF JACKSON

_____

ATTEST: Arne O. Jorgensen, Mayor

_____

Lynsey Lenamond, Deputy Town Clerk

Minutes: ll. Publish JH News & Guide: October 15, 2025

Report Criteria:
Detail report.
Invoices with totals above $0 included.
Paid and unpaid invoices included.

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
51	ACE HARDWARE	918850-2	PAID TWICE	08/27/2025	148.56-	.00	
51	ACE HARDWARE	919405	BAGS	09/03/2025	4,188.00	.00	
51	ACE HARDWARE	919779	WASP KILLER	09/06/2025	5.00	.00	
51	ACE HARDWARE	919847	TREE PRUNER	09/08/2025	69.99	.00	
51	ACE HARDWARE	920110	BAR & CHAIN KIT	09/10/2025	104.99	.00	
51	ACE HARDWARE	920132	PAINT	09/10/2025	258.96	.00	
51	ACE HARDWARE	920159	SPARK PLUG, FILTERS, BLADE	09/10/2025	144.40	.00	
51	ACE HARDWARE	920205	RETURN PAINT	09/10/2025	129.48-	.00	
51	ACE HARDWARE	920552	VALVE, ADAPTER, CLAMP, TAPE	09/15/2025	86.30	.00	
51	ACE HARDWARE	920704	WIRE LOCK	09/16/2025	18.76	.00	
51	ACE HARDWARE	920790	AQUAPHALT PATCHES	09/17/2025	3,599.28	.00	
51	ACE HARDWARE	921015	HOSE, TIMER, ELBOW, TEFLON	09/18/2025	142.90	.00	
51	ACE HARDWARE	921061	PAINT	09/19/2025	43.16	.00	
51	ACE HARDWARE	921549	BLOWOFF DUSTER	09/24/2025	11.99	.00	
51	ACE HARDWARE	921552	JIG BLADE & JIGSAW HANDLE	09/24/2025	272.98	.00	
51	ACE HARDWARE	921659	STARTER FLUID & STIHL LENS	09/25/2025	39.97	.00	
51	ACE HARDWARE	921742	TAPE & LUBE	09/25/2025	39.94	.00	
51	ACE HARDWARE	921771	SCREWS & TOOL	09/26/2025	38.98	.00	
51	ACE HARDWARE	921800	ROPE	09/26/2025	29.99	.00	
51	ACE HARDWARE	922029	SPRAYER	09/29/2025	16.99	.00	
51	ACE HARDWARE	922226	OVEN CLEANER	10/01/2025	7.99	.00	
51	ACE HARDWARE	922311	PAINT	10/01/2025	25.98	.00	
51	ACE HARDWARE	922428	PAINT	10/02/2025	2.00-	.00	
51	ACE HARDWARE	922432	MAGNETIC BIT HOLDER & SPA	10/02/2025	19.98	.00	
51	ACE HARDWARE	922483	CAULK, TOWEL ROLL, COUPLE	10/03/2025	70.42	.00	
51	ACE HARDWARE	922760	SPRAY BOTTLE, HEADLIGHT, &	10/07/2025	58.96	.00	
51	ACE HARDWARE	922828	JOINT COMPOUND & TEFLON T	10/07/2025	20.48	.00	
Total 51:					9,036.35	.00	
6861	ADVANCED NETWORK MANAG	IN110090	CISCO BREACH PROTECTION	09/22/2025	44,733.00	.00	
Total 6861:					44,733.00	.00	
7544	ALLEGION ACCESS TECHNOLO	90072213	INSPECTION CONTRACT 8/12/2	10/01/2025	696.00	.00	
Total 7544:					696.00	.00	
6524	ALPHAGRAPHICS	IX-475671	PAID TWICE - CREDIT	07/01/2025	350.17-	.00	
Total 6524:					350.17-	.00	
5726	AMAZON	111-3819967-6	KNIFE BLADES	10/02/2025	30.00	.00	
5726	AMAZON	111-8863687-1	WIPES	10/02/2025	181.02	.00	
5726	AMAZON	16VF-WJJG-3F	DESK MATS	09/25/2025	209.48	.00	
5726	AMAZON	17CH-3961-QV	FORKS & MOUSE PAD	10/03/2025	54.98	.00	
5726	AMAZON	17NQ-TMVR-7	ENVELOPES	10/07/2025	59.12	.00	
5726	AMAZON	17VM-VLTN-76	CHARGING STATION	09/30/2025	239.97	.00	
5726	AMAZON	193C-D9FK-99	RETURN TV	09/29/2025	238.78-	.00	
5726	AMAZON	19LF-HGL6-RP	KEYBOARDS, MICE, & ADAPTE	09/21/2025	995.06	.00	
5726	AMAZON	1CVP-TWLP-4	STRAP & CASE	09/25/2025	354.00	.00	
5726	AMAZON	1DWH-9XKL-6	TV	09/29/2025	299.99	.00	
5726	AMAZON	1F6V-L4FC-DM	TIRE PASTE	09/26/2025	24.57	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
5726	AMAZON	1FL7-7XV1-FY	KEYBOARD	09/23/2025	45.98	.00	
5726	AMAZON	1LCQ-KRWF-6	HDMI DONGLE	09/22/2025	28.49	.00	
5726	AMAZON	1NVN-34XJ-4D	VACUUM	10/01/2025	145.49	.00	
5726	AMAZON	1Q3C-CL1L-N	RETURN KEYBOARD	09/26/2025	45.98-	.00	
5726	AMAZON	1TQL-VVMX-4	NAME TAPES	09/29/2025	29.00	.00	
5726	AMAZON	1VLM-TY1W-7	CHARGING STATION	09/30/2025	239.97	.00	
5726	AMAZON	1XWD-G3HR-4	AIRPODS	09/24/2025	1,494.00	.00	
5726	AMAZON	1YRV-KPYT-F1	TV	09/19/2025	238.78	.00	
Total 5726:					4,385.14	.00	
4389	APPLE INC	MC08231072	SHIPPING	09/24/2025	17.00	.00	
4389	APPLE INC	MC08558236	2 IPHONES & PLUGINS	09/25/2025	3,596.00	.00	
4389	APPLE INC	MC09178687	IPHONE & PLUGIN	09/26/2025	1,798.00	.00	
Total 4389:					5,411.00	.00	
1783	AT&T	287279795460	IPADS	09/11/2025	315.55	.00	
Total 1783:					315.55	.00	
4920	BEST BEST & KRIEGER	1025588	FRANCHISE RENEWAL MATTER	04/14/2025	3,950.00	.00	
Total 4920:					3,950.00	.00	
3500	BISON LUMBER	2509-886156	BRONZE START DRIVE	09/04/2025	70.15	.00	
3500	BISON LUMBER	2509-886174	SAW BLADES	09/04/2025	23.91	.00	
3500	BISON LUMBER	2509-886433	CONCRETE BAGS	09/08/2025	36.78	.00	
Total 3500:					130.84	.00	
7741	BLUE DOOR LLC	100925	RELEASE BOND DEM23-0021	10/09/2025	5,000.00	5,000.00	10/09/2025
Total 7741:					5,000.00	5,000.00	
1560	BLUE SPRUCE CLEANERS,INC	08-105801	LAUNDRY	09/08/2025	17.05	.00	
1560	BLUE SPRUCE CLEANERS,INC	08-105861	LAUNDRY	09/05/2025	23.83	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-100157	LAUNDRY	09/08/2025	27.20	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-101307	LAUNDRY	09/11/2025	17.05	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-102227	LAUNDRY	09/16/2025	24.70	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-102267	LAUNDRY	09/17/2025	9.00	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-102394	LAUNDRY	09/17/2025	4.50	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-102516	LAUNDRY	09/18/2025	45.95	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-102802	LAUNDRY	09/19/2025	66.55	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-104108	LAUNDRY	09/25/2025	37.50	.00	
1560	BLUE SPRUCE CLEANERS,INC	09-104274	LAUNDRY	09/26/2025	17.05	.00	
Total 1560:					290.38	.00	
7394	BOLAND, ANITA	110125	350 N Millward - November Rent	11/01/2025	2,263.80	.00	
Total 7394:					2,263.80	.00	
6727	BRIGGS, ERIC L	38898	3/8 DR 3 PC STD	09/18/2025	103.63	.00	
Total 6727:					103.63	.00	
7699	Brown, David M.	09292025	CDL TRAINING FOR PAX SHAN	09/29/2025	856.50	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
Total 7699:					856.50	.00	
7077	BURKHOLDER, SHAWN	110125	130 E Kelly ♦ November Rent	11/01/2025	2,141.61	.00	
Total 7077:					2,141.61	.00	
6051	CARPETS PLUS COLORTILE	11611	VINE STREET FLOORING & LAB	09/23/2025	9,330.70	.00	
Total 6051:					9,330.70	.00	
102	CASELLE INC.	INV-11540	MAINTENANCE & SUPPORT NO	10/01/2025	2,388.00	.00	
Total 102:					2,388.00	.00	
544	CENTURYLINK	752728462	INTERNET	09/20/2025	51.70-	.00	
544	CENTURYLINK	SEPT25-33389	PHONE SERVICE	09/07/2025	172.11-	.00	
544	CENTURYLINK	SEPT25-33406	PHONE SERVICE	09/13/2025	66.48	.00	
Total 544:					157.33-	.00	
6257	CERTIFIED LABORATORIES	9328753	PREMALUBE FIBER	09/25/2025	905.85	.00	
Total 6257:					905.85	.00	
7089	CHARLIE'S PLUMBING OF JH	13705	HYDROJET MAIN LINE	09/25/2025	785.00	.00	
Total 7089:					785.00	.00	
5967	CITY OF DRIGGS	BBSTART2025	RENT OCT & ELECTRIC SEPT	10/06/2025	1,661.75	.00	
Total 5967:					1,661.75	.00	
6001	CIVICPLUS	351133	MO PLATFORM-STANDARD NE	10/01/2025	7,187.50	.00	
Total 6001:					7,187.50	.00	
7737	CLEARY, GREG	10012025	TRAVEL REIMBURSEMENT	10/01/2025	1,581.11	.00	
Total 7737:					1,581.11	.00	
514	CONRAD & BISCHOFF INC.	IN-881211-25	ETHANOL & DIESEL	09/18/2025	28,993.10	.00	
514	CONRAD & BISCHOFF INC.	IN-895718-25	DEF BULK	09/29/2025	695.13	.00	
Total 514:					29,688.23	.00	
7734	CONRONTIZIES, ARTHUR	092925	RELEASE BOND 795 SNOW KIN	09/29/2025	1,000.00	1,000.00	09/30/2025
Total 7734:					1,000.00	1,000.00	
4887	CONTROL SYSTEM TECHNOLO	11664	SCADA WORK	09/22/2025	300.00	.00	
4887	CONTROL SYSTEM TECHNOLO	11665	TROUBLESHOOT SCADA COMP	09/22/2025	300.00	.00	
4887	CONTROL SYSTEM TECHNOLO	11668	INSTALL SOFTWARE PATCH ON	09/22/2025	600.00	.00	
4887	CONTROL SYSTEM TECHNOLO	11669	SOFTWARE PATCH ON SCADA	09/22/2025	300.00	.00	
4887	CONTROL SYSTEM TECHNOLO	11679	ADDED PROGRAM LOGIC & AL	10/07/2025	900.00	.00	
Total 4887:					2,400.00	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
7500	CONWAY, LARS	110125	145 Moose - November Rent	11/01/2025	2,500.00	.00	
Total 7500:					2,500.00	.00	
1691	CORE & MAIN LP	X662171	3/4 MACH10 GAL R900I EU1C2G	09/17/2025	75,000.00	.00	
1691	CORE & MAIN LP	X662171	3/4 MACH10 GAL R900I EU1C2G	09/17/2025	76,200.00	.00	
Total 1691:					151,200.00	.00	
5777	CURTIS BLUE LINE INC.	INV994728	FIRST DEFENSE AEROSOL & O	09/30/2025	989.89	.00	
Total 5777:					989.89	.00	
7745	DAVID R BALL	25-276-003	MOTORCYCLE COURSE	10/03/2025	2,889.00	.00	
7745	DAVID R BALL	25-276-003	MOTORCYCLE COURSE	10/03/2025	6,000.00	.00	
Total 7745:					8,889.00	.00	
7649	DECKER GLASS	IRSW010014	WINDSHIELD	09/25/2025	207.20	.00	
7649	DECKER GLASS	IRSW010025	WINDSHIELD	09/25/2025	248.49	.00	
Total 7649:					455.69	.00	
148	DELL	10838053974	VLA COPILOT	09/25/2025	4,794.20	.00	
148	DELL	10838053990	VLA PROJECT SUBSCRIPTION	09/25/2025	657.46	.00	
Total 148:					5,451.66	.00	
708	DELTA DENTAL PLAN OF WYOM	10012025	OCTOBER 2025 ADMIN FEES	10/01/2025	712.40	712.40	10/10/2025
708	DELTA DENTAL PLAN OF WYOM	10012025	OCTOBER 2025 CLAIMS	10/01/2025	6,858.03	6,858.03	10/10/2025
Total 708:					7,570.43	7,570.43	
3881	DEX IMAGING	AR13817049	PRINTER	08/15/2025	939.23	.00	
3881	DEX IMAGING	AR14014840	COPIES	09/22/2025	55.45	.00	
3881	DEX IMAGING	AR14024195	TONER	09/23/2025	127.22	.00	
3881	DEX IMAGING	AR14032423	PRINTERS	09/24/2025	632.53	.00	
3881	DEX IMAGING	AR14112941	PRINTER REPAIR	10/08/2025	189.00	.00	
Total 3881:					1,943.43	.00	
6883	DIVISION OF CHILD SUPPORT	10022025	DCSE CASE #0005405448	10/02/2025	509.23	509.23	10/02/2025
Total 6883:					509.23	509.23	
2175	DIVISION OF VICTIM SERVICES	10022025	Crime Victim Surcharge	10/02/2025	300.00	.00	
Total 2175:					300.00	.00	
6939	DYNAMIC CONTROLS, LLC	40115	INTERCOM INSTALL	09/11/2025	13,218.00	.00	
Total 6939:					13,218.00	.00	
7446	ELAN ONE CARD	9302025	Admin 3567 UNITED	09/30/2025	210.18	210.18	10/10/2025
7446	ELAN ONE CARD	9302025	Animal Shelter 3324 TETON TAIL	09/30/2025	33.36	33.36	10/10/2025
7446	ELAN ONE CARD	9302025	Building 8958 UNITED	09/30/2025	35.00	35.00	10/10/2025
7446	ELAN ONE CARD	9302025	Community Development 3840 P	09/30/2025	47.11	47.11	10/10/2025
7446	ELAN ONE CARD	9302025	Detective Sergeant 6677 BEST B	09/30/2025	21.18	21.18	10/10/2025

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
7446	ELAN ONE CARD	9302025	Facilities PW 4135 2201 SPRINK	09/30/2025	20.21	20.21	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 SUPPLYHOU	09/30/2025	216.67	216.67	10/10/2025
7446	ELAN ONE CARD	9302025	IT 7309 AMAZON	09/30/2025	78.99	78.99	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Training One 7130 SNAKE R	09/30/2025	65.00	65.00	10/10/2025
7446	ELAN ONE CARD	9302025	Lieutenant 7867 GLOCK	09/30/2025	300.00	300.00	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	11.76	11.76	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	21.95	21.95	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 SMITHS	09/30/2025	10.00	10.00	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 TETON CO CLE	09/30/2025	19.55	19.55	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 SMITHS	09/30/2025	40.22	40.22	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 4IMPRINT	09/30/2025	368.53	368.53	10/10/2025
7446	ELAN ONE CARD	9302025	Town Council 2 8506 PARK CITY	09/30/2025	500.00	500.00	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 TARGET	09/30/2025	101.67	101.67	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 TARGET	09/30/2025	51.97	51.97	10/10/2025
7446	ELAN ONE CARD	9302025	Animal Shelter 3324 DASH MEDI	09/30/2025	88.10	88.10	10/10/2025
7446	ELAN ONE CARD	9302025	Building 8958 UNITED	09/30/2025	33.31	33.31	10/10/2025
7446	ELAN ONE CARD	9302025	Community Development 3840 C	09/30/2025	41.98	41.98	10/10/2025
7446	ELAN ONE CARD	9302025	Detective Sergeant 6677 ACE	09/30/2025	21.39	21.39	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 TRUDOOR	09/30/2025	393.96	393.96	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 ULINE	09/30/2025	931.54	931.54	10/10/2025
7446	ELAN ONE CARD	9302025	IT 7309 STARLINK	09/30/2025	660.00	660.00	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Sergeant 2280 SIGNATURE	09/30/2025	1,822.66	1,822.66	10/10/2025
7446	ELAN ONE CARD	9302025	Lieutenant 7867 SCOUT INN	09/30/2025	347.65	347.65	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	245.91	245.91	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	44.87	44.87	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 JAMAR TECHN	09/30/2025	303.75	303.75	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 JAMAR TECHN	09/30/2025	420.00	420.00	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 JENDCO SAFET	09/30/2025	209.25	209.25	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 DORNANS	09/30/2025	195.17	195.17	10/10/2025
7446	ELAN ONE CARD	9302025	Town Council 2 8506 PILOT	09/30/2025	17.99	17.99	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 TARGET	09/30/2025	26.73	26.73	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 TARGET	09/30/2025	40.34	40.34	10/10/2025
7446	ELAN ONE CARD	9302025	Animal Shelter 3324 IDAHO STE	09/30/2025	275.00	275.00	10/10/2025
7446	ELAN ONE CARD	9302025	Building 8958 CAF♦ GENEVIEVE	09/30/2025	209.29	209.29	10/10/2025
7446	ELAN ONE CARD	9302025	Community Development 3840 P	09/30/2025	1,943.25	1,943.25	10/10/2025
7446	ELAN ONE CARD	9302025	Detective Sergeant 6677 HAT SIX	09/30/2025	29.59	29.59	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 SUPPLYHOU	09/30/2025	93.95	93.95	10/10/2025
7446	ELAN ONE CARD	9302025	Finance 9639 BLUE360	09/30/2025	103.95	103.95	10/10/2025
7446	ELAN ONE CARD	9302025	IT 7309 BELLROY OPERATIONS	09/30/2025	111.08	111.08	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Training Two 6480 YIPPY I-O	09/30/2025	32.58	32.58	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	500.00	500.00	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	13.90	13.90	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	169.00	169.00	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 AMAZON	09/30/2025	15.60	15.60	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 JENDCO SAFET	09/30/2025	156.92	156.92	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 STAPLES	09/30/2025	77.93	77.93	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 ALBERTSONS	09/30/2025	64.97	64.97	10/10/2025
7446	ELAN ONE CARD	9302025	Town Council 2 8506 DELTA AIR	09/30/2025	593.56	593.56	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 HILTON DIS	09/30/2025	630.00	630.00	10/10/2025
7446	ELAN ONE CARD	9302025	WWTP 2901 PSI EXAMS	09/30/2025	106.00	106.00	10/10/2025
7446	ELAN ONE CARD	9302025	Animal Shelter 3324 TETON TAIL	09/30/2025	92.26	92.26	10/10/2025
7446	ELAN ONE CARD	9302025	Building 8958 UNITED	09/30/2025	35.00	35.00	10/10/2025
7446	ELAN ONE CARD	9302025	Community Development 3840 M	09/30/2025	135.00	135.00	10/10/2025
7446	ELAN ONE CARD	9302025	Detective Sergeant 6677 UPS	09/30/2025	36.31	36.31	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 FIX.COM	09/30/2025	128.35	128.35	10/10/2025
7446	ELAN ONE CARD	9302025	Finance 9639 SMITHS	09/30/2025	263.58	263.58	10/10/2025
7446	ELAN ONE CARD	9302025	IT 7309 ALBERTSONS	09/30/2025	116.03	116.03	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Training Two 6480 LAW ENF	09/30/2025	460.00	460.00	10/10/2025

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
7446	ELAN ONE CARD	9302025	Lieutenant 7867 GLOCK	09/30/2025	300.00	300.00	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	330.00	330.00	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	21.95	21.95	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 SMITHS	09/30/2025	10.00	10.00	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 AMAZON	09/30/2025	13.67	13.67	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 SMITHS	09/30/2025	250.00	250.00	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 ALBERTSONS	09/30/2025	57.56	57.56	10/10/2025
7446	ELAN ONE CARD	9302025	Town Council 2 8506 HOTEL ALP	09/30/2025	238.03	238.03	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 COCA COL	09/30/2025	32.48	32.48	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 KEYSTONE	09/30/2025	664.50	664.50	10/10/2025
7446	ELAN ONE CARD	9302025	Animal Shelter 3324 PET PLACE	09/30/2025	74.39	74.39	10/10/2025
7446	ELAN ONE CARD	9302025	Building 8958 UNITED	09/30/2025	374.79	374.79	10/10/2025
7446	ELAN ONE CARD	9302025	Chief of Police 0494 AUDIBLE	09/30/2025	16.00	16.00	10/10/2025
7446	ELAN ONE CARD	9302025	Detective Sergeant 6677 UPS	09/30/2025	32.75	32.75	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 ATS MACHINE	09/30/2025	269.03	269.03	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 SUPPLYHOU	09/30/2025	408.54	408.54	10/10/2025
7446	ELAN ONE CARD	9302025	IT 7309 GARMIN	09/30/2025	64.95	64.95	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Sergeant 2280 PRINT PLAC	09/30/2025	115.17	115.17	10/10/2025
7446	ELAN ONE CARD	9302025	Lieutenant 7867 SIDEWINDERS	09/30/2025	156.54	156.54	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	62.99	62.99	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	16.55	16.55	10/10/2025
7446	ELAN ONE CARD	9302025	Planning 5582 DELTA AIR	09/30/2025	1,143.82	1,143.82	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 SMITHS	09/30/2025	2.99	2.99	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 JENDCO SAFET	09/30/2025	104.61	104.61	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 ALBERTSONS	09/30/2025	190.49	190.49	10/10/2025
7446	ELAN ONE CARD	9302025	Start Operations 4059 DORNANS	09/30/2025	6.68	6.68	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 DOMINOS	09/30/2025	40.65	40.65	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 JACKALOP	09/30/2025	20.00	20.00	10/10/2025
7446	ELAN ONE CARD	9302025	Admin 3567 UNITED	09/30/2025	168.49	168.49	10/10/2025
7446	ELAN ONE CARD	9302025	Animal Shelter 3324 SMITHS	09/30/2025	127.82	127.82	10/10/2025
7446	ELAN ONE CARD	9302025	Building 8958 STAPLES	09/30/2025	160.49	160.49	10/10/2025
7446	ELAN ONE CARD	9302025	Community Development 3840 P	09/30/2025	46.33	46.33	10/10/2025
7446	ELAN ONE CARD	9302025	Detective Sergeant 6677 OPTIMA	09/30/2025	51.70	51.70	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 HOME DEPO	09/30/2025	310.30	310.30	10/10/2025
7446	ELAN ONE CARD	9302025	IT 7309 OC MOUNTS	09/30/2025	144.98	144.98	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Sergeant 2280 EXPEDIA	09/30/2025	275.50	275.50	10/10/2025
7446	ELAN ONE CARD	9302025	Legal 7687 TETON CO CLERK	09/30/2025	19.55	19.55	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	315.00	315.00	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	13.55	13.55	10/10/2025
7446	ELAN ONE CARD	9302025	Planning 5582 MOUNTAINTOWN	09/30/2025	508.57	508.57	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 AMAZON	09/30/2025	177.48	177.48	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 JENDCO SAFET	09/30/2025	156.91	156.91	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 STILLWEST	09/30/2025	96.52	96.52	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 ALBERTSONS	09/30/2025	73.96	73.96	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 OVERSTOC	09/30/2025	83.92-	83.92-	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 PINKY G'S	09/30/2025	111.02	111.02	10/10/2025
7446	ELAN ONE CARD	9302025	Animal Shelter 3324 SMITHS	09/30/2025	39.95	39.95	10/10/2025
7446	ELAN ONE CARD	9302025	Building 8958 UNITED	09/30/2025	33.31	33.31	10/10/2025
7446	ELAN ONE CARD	9302025	Community Development 3840 P	09/30/2025	26.97	26.97	10/10/2025
7446	ELAN ONE CARD	9302025	Detective Sergeant 6677 TARGET	09/30/2025	37.25	37.25	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 KLEEN RITE	09/30/2025	19.05	19.05	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 GRAINGER	09/30/2025	1,443.18	1,443.18	10/10/2025
7446	ELAN ONE CARD	9302025	IT 7309 BEST BUY	09/30/2025	87.79	87.79	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Training One 7130 CREEKSI	09/30/2025	79.72	79.72	10/10/2025
7446	ELAN ONE CARD	9302025	Lieutenant 7867 SCOUT INN	09/30/2025	337.66	337.66	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	74.99	74.99	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	21.95	21.95	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 HOME DEPOT	09/30/2025	1,106.00	1,106.00	10/10/2025

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
7446	ELAN ONE CARD	9302025	PW Admin 4874 TETON CO CLE	09/30/2025	73.84	73.84	10/10/2025
7446	ELAN ONE CARD	9302025	PW Fleet 0463 COBALT TRUCK	09/30/2025	1,322.92	1,322.92	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 DORNANS	09/30/2025	10.70	10.70	10/10/2025
7446	ELAN ONE CARD	9302025	Town Council 2 8506 HOLIDAY IN	09/30/2025	181.42	181.42	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 49ER INN &	09/30/2025	713.64	713.64	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 TARGET	09/30/2025	26.39	26.39	10/10/2025
7446	ELAN ONE CARD	9302025	Animal Shelter 3324 PET PLACE	09/30/2025	135.96	135.96	10/10/2025
7446	ELAN ONE CARD	9302025	Building 8958 INTL CODE COUN	09/30/2025	167.50	167.50	10/10/2025
7446	ELAN ONE CARD	9302025	Community Development 3840 P	09/30/2025	7.99	7.99	10/10/2025
7446	ELAN ONE CARD	9302025	Detective Sergeant 6677 HILTON	09/30/2025	248.60	248.60	10/10/2025
7446	ELAN ONE CARD	9302025	Facilities PW 4135 BUBBA'S BBQ	09/30/2025	129.00	129.00	10/10/2025
7446	ELAN ONE CARD	9302025	Finance 9639 SNAKE RIVER RO	09/30/2025	56.00	56.00	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Sergeant 2280 USPS	09/30/2025	9.25	9.25	10/10/2025
7446	ELAN ONE CARD	9302025	JPD Training Two 6480 GALLS	09/30/2025	37.79	37.79	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	238.03	238.03	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	91.23	91.23	10/10/2025
7446	ELAN ONE CARD	9302025	Personnel-Internal Services 7099	09/30/2025	18.96	18.96	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 AMAZON	09/30/2025	10.41	10.41	10/10/2025
7446	ELAN ONE CARD	9302025	PW Admin 4874 JENDCO SAFET	09/30/2025	209.22	209.22	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 SMITHS	09/30/2025	23.53	23.53	10/10/2025
7446	ELAN ONE CARD	9302025	Start Admin 9251 STAPLES	09/30/2025	103.46	103.46	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 VALLEY BO	09/30/2025	62.04	62.04	10/10/2025
7446	ELAN ONE CARD	9302025	Victim Services 1944 COMMON C	09/30/2025	39.48	39.48	10/10/2025
7446	ELAN ONE CARD	9302025	WWTP 2901 E GAUGE SYSTEM	09/30/2025	20.00	20.00	10/10/2025
	Total 7446:				29,329.61	29,329.61	
6092	ENERGY 1	53693	FORCED AIR COOLING	09/25/2025	1,016.10	.00	
	Total 6092:				1,016.10	.00	
1134	ENERGY LABORATORIES INC.	737181	PHOSPHORUS	09/19/2025	183.00	.00	
1134	ENERGY LABORATORIES INC.	738631	OIL & GREASE	09/25/2025	172.00	.00	
1134	ENERGY LABORATORIES INC.	739446	OIL & GREASE	09/29/2025	172.00	.00	
1134	ENERGY LABORATORIES INC.	740776	PHOSPHORUS	10/06/2025	183.00	.00	
	Total 1134:				710.00	.00	
6552	ETNA TRADE PARK LLC	110125	Star Valley Bus Storage - Novemb	11/01/2025	4,062.00	.00	
	Total 6552:				4,062.00	.00	
81	EVANS CONSTRUCTION INC	260424	BLOCKS	09/15/2025	1,561.00	.00	
	Total 81:				1,561.00	.00	
3195	FERGUSON ENTERPRISES, IN	4010043	LF 1 WTR PRV	09/11/2025	250.26	.00	
3195	FERGUSON ENTERPRISES, IN	4038303	SIZZLE	09/23/2025	23.40	.00	
	Total 3195:				273.66	.00	
4709	FLEETPRIDE	125630481	FLARE CONNECTOR	05/09/2025	122.90	.00	
4709	FLEETPRIDE	128408587	STEERING SHAFT YOKE & DRI	08/29/2025	541.86	.00	
4709	FLEETPRIDE	128792959	COVER PLATE	09/16/2025	344.08	.00	
4709	FLEETPRIDE	12962585	FLARE CONNECT	03/05/2025	65.08	.00	
	Total 4709:				1,073.92	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
6676	Fodor Law Office	5737	ENCROACHMENT AGREEMENT	08/15/2025	745.00	.00	
	Total 6676:				745.00	.00	
6779	FOSTER, KYLE	10012025	MEALS FOR FBI VEHICLE DYNA	10/01/2025	136.00	.00	
	Total 6779:				136.00	.00	
4394	FREMONT MOTOR CO.	100125	RELEASE BID BONDS	10/01/2025	8,468.00	8,468.00	10/01/2025
4394	FREMONT MOTOR CO.	100125	RELEASE BID BONDS	10/01/2025	5,256.20	5,256.20	10/01/2025
	Total 4394:				13,724.20	13,724.20	
7624	GANNETT PEAK SURVEYING, L	1428	SNOW KING BEFORE MILLING	10/02/2025	2,250.00	.00	
	Total 7624:				2,250.00	.00	
7683	GET FUNKY LLC	18341	LOT MONTHLY RENT OCT-DEC	09/30/2025	14,727.00	.00	
	Total 7683:				14,727.00	.00	
7744	GRAND TETON PLAZA	100925	RELEASE BOND B25-0072 800	10/09/2025	8,000.00	8,000.00	10/09/2025
	Total 7744:				8,000.00	8,000.00	
7497	GRIFFITH PARTNERSHIP LLC	110125	126 Aspen Dr - November Rent	11/01/2025	1,760.00	.00	
	Total 7497:				1,760.00	.00	
7583	HAYES, BRANDY	10082025	TRAVEL - COVA CONFERENCE	10/08/2025	162.00	.00	
	Total 7583:				162.00	.00	
4988	HD FOWLER COMPANY	I7134693	ADAPTERS	09/22/2025	1,198.24	.00	
	Total 4988:				1,198.24	.00	
96	HIGH COUNTRY LINEN	0527469	LAUNDRY	09/08/2025	28.76	.00	
96	HIGH COUNTRY LINEN	0527469	LAUNDRY	09/08/2025	40.19	.00	
96	HIGH COUNTRY LINEN	0528873	LAUNDRY	09/15/2025	5.37	.00	
96	HIGH COUNTRY LINEN	0528873	LAUNDRY	09/15/2025	.40	.00	
96	HIGH COUNTRY LINEN	0528873	LAUNDRY	09/15/2025	28.76	.00	
96	HIGH COUNTRY LINEN	0530234	Laundry	09/22/2025	86.44	.00	
96	HIGH COUNTRY LINEN	0530235	LAUNDRY	09/22/2025	31.29	.00	
96	HIGH COUNTRY LINEN	0530235	LAUNDRY	09/22/2025	22.69	.00	
96	HIGH COUNTRY LINEN	0530802	MATS	09/24/2025	72.94	.00	
96	HIGH COUNTRY LINEN	0530934	MATS	09/24/2025	308.79	.00	
96	HIGH COUNTRY LINEN	0531060	Laundry	09/25/2025	9.17	.00	
96	HIGH COUNTRY LINEN	0531060	Laundry	09/25/2025	18.55	.00	
96	HIGH COUNTRY LINEN	0531060	Laundry	09/25/2025	6.65	.00	
96	HIGH COUNTRY LINEN	0531060	Laundry	09/25/2025	14.68	.00	
96	HIGH COUNTRY LINEN	0531060	Laundry	09/25/2025	59.93	.00	
96	HIGH COUNTRY LINEN	0531060	Laundry	09/25/2025	20.53	.00	
96	HIGH COUNTRY LINEN	0531060	Laundry	09/25/2025	13.30	.00	
96	HIGH COUNTRY LINEN	0531060	Laundry	09/25/2025	6.65	.00	
96	HIGH COUNTRY LINEN	0531576	Laundry	09/29/2025	28.76	.00	
96	HIGH COUNTRY LINEN	0531576	Laundry	09/29/2025	5.37	.00	
96	HIGH COUNTRY LINEN	0531576	Laundry	09/29/2025	.40	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
96	HIGH COUNTRY LINEN	0531658	MATS	09/29/2025	23.45	.00	
96	HIGH COUNTRY LINEN	0532088	IAUNDRY	10/01/2025	69.58	.00	
96	HIGH COUNTRY LINEN	S0530960	SOAP	09/24/2025	60.95	.00	
96	HIGH COUNTRY LINEN	S0531229	LINERS	09/25/2025	62.50	.00	
Total 96:					1,026.10	.00	
7735	HNTB CORPORATION	001-91066-DS-	ORDER 1 FOR 4 GILLIG DIESEL	08/11/2025	2,518.75	.00	
7735	HNTB CORPORATION	001-91066-DS-	ORDER 2 - 2 MCI DIESEL COAC	09/10/2025	3,998.71	.00	
Total 7735:					6,517.46	.00	
6922	HORCHAK, KEVIN	10012025	MEALS FOR FBI VEHICLE DYNA	10/01/2025	136.00	.00	
Total 6922:					136.00	.00	
36	IDAHO STATE TAX COMMISSIO	09302025	SEPTEMBER 2025 TAXES	09/30/2025	6,934.00	6,934.00	10/02/2025
Total 36:					6,934.00	6,934.00	
6954	IVY OUTDOOR SERVICES LLC	0000166	SEPT BUS ROUTE TRASH	10/02/2025	2,182.57	.00	
Total 6954:					2,182.57	.00	
6931	JACKSON DOWNTOWNER, LLC	JKD-1054	NOVEMBER ON DEMAND & FU	10/08/2025	102,658.89	.00	
Total 6931:					102,658.89	.00	
7163	JACKSON GROUP LOCKBOX	701141IF	STUDS, NUTS, GASKETS, INJE	07/29/2025	5,165.22	.00	
7163	JACKSON GROUP LOCKBOX	701141IFX1	LOWER ENGINE KIT	08/07/2025	293.02	.00	
7163	JACKSON GROUP LOCKBOX	701141IFX2	TURBOCHARGER	08/27/2025	52.86	.00	
7163	JACKSON GROUP LOCKBOX	701141IFX3	TURBOCHARGER	09/22/2025	3,259.82	.00	
7163	JACKSON GROUP LOCKBOX	703090IFX1-2	AIR DRYER VALVE	08/14/2025	48.74	.00	
7163	JACKSON GROUP LOCKBOX	703645IF-2	BRAKE PADS	08/19/2025	1,495.88	.00	
7163	JACKSON GROUP LOCKBOX	705065IF	LIGHT SOUNDOFF SIGNAL	09/19/2025	2,223.65	.00	
7163	JACKSON GROUP LOCKBOX	705764IF	GLOVES	09/16/2025	108.20	.00	
7163	JACKSON GROUP LOCKBOX	706288IF	KIT CARTRIDGE	09/23/2025	309.54	.00	
7163	JACKSON GROUP LOCKBOX	706288IFX1	KIT CARTRIDGE	09/24/2025	309.54	.00	
7163	JACKSON GROUP LOCKBOX	706548IF	FILTERS	09/25/2025	762.56	.00	
7163	JACKSON GROUP LOCKBOX	CM702245IFX	PRO-TORQ SPINDLE	08/12/2025	57.02-	.00	
Total 7163:					13,972.01	.00	
6474	JACKSON HOLE LAW, PC	2681	SEPTEMBER PROSECUTION S	09/30/2025	3,502.50	.00	
Total 6474:					3,502.50	.00	
131	JACKSON HOLE NEWS & GUID	381775	ADVERTISING	09/24/2025	55.00	.00	
131	JACKSON HOLE NEWS & GUID	381961	WATER RESTRICTION	09/30/2025	681.80	.00	
131	JACKSON HOLE NEWS & GUID	382137	HOLE SCROLL	09/30/2025	375.00	.00	
131	JACKSON HOLE NEWS & GUID	382216	FULL TIME TRANSIT OPERATO	10/01/2025	240.00	.00	
131	JACKSON HOLE NEWS & GUID	382360	CLASSIFIEDS PICK UP	10/08/2025	304.00	.00	
Total 131:					1,655.80	.00	
114	JACKSON LUMBER INC	0001127964-00	METAL CUTTING WHEEL, SAFE	09/12/2025	29.71	.00	
114	JACKSON LUMBER INC	0001128016-00	SAW BLADE & IMPACT BIT	09/15/2025	62.00	.00	
114	JACKSON LUMBER INC	0001128161-00	WOOD	09/16/2025	319.62	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
Total 114:					411.33	.00	
115	JACKSON PAINT AND GLASS, I	I139072	GLASS	08/20/2025	1,962.84	.00	
Total 115:					1,962.84	.00	
7442	JOE JOHNSON EQUIPMENT	P03274	QUICK CONNECT	10/01/2025	176.77	.00	
Total 7442:					176.77	.00	
7118	JONES SIMKINS	67254	AUDIT FOR FINANCIAL STATEM	09/30/2025	41,715.00	.00	
Total 7118:					41,715.00	.00	
139	JORGENSEN ASSOCIATES, PC	56825	GREGORY LANE	09/02/2025	25,993.46	.00	
139	JORGENSEN ASSOCIATES, PC	56825	GREGORY LANE	09/02/2025	25,993.46	.00	
139	JORGENSEN ASSOCIATES, PC	56825	GREGORY LANE	09/02/2025	25,993.46	.00	
139	JORGENSEN ASSOCIATES, PC	68419	WATER & SEWER MODELING	10/01/2025	1,395.00	.00	
Total 139:					79,375.38	.00	
5537	KEENAN, PETER	110125	Virginian 55-4 - November Rent	11/01/2025	2,357.50	.00	
Total 5537:					2,357.50	.00	
7675	KGB PRODUCTIONS	10387	VIDEO & PHOTO CONTENT	08/28/2025	4,850.00	.00	
Total 7675:					4,850.00	.00	
3332	KILMER'S BG DISTRIBUTING	18671	DFCT 53 GAL	09/18/2025	9,000.00	.00	
Total 3332:					9,000.00	.00	
7112	KJ'S SERVICES INVESTMENTS	110125	Alpine - November Rent	11/01/2025	2,940.00	.00	
7112	KJ'S SERVICES INVESTMENTS	110125	Alpine - November Internet	11/01/2025	35.00	.00	
Total 7112:					2,975.00	.00	
7715	LOTUS ENGINEERING & SUSTA	1902	WY GHG PROJECT	10/03/2025	9,547.50	.00	
Total 7715:					9,547.50	.00	
156	LOWER VALLEY ENERGY INC	110125	355 W Deloney E5 - November R	11/01/2025	3,000.00	.00	
156	LOWER VALLEY ENERGY INC	92050-002 09-	3150 S ADAMS CANYON DR, JA	09/30/2025	192.61	192.61	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-003 09-	SPRUCE DR PUMP HOUSE, JA	09/30/2025	305.14	305.14	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-008 09-	CEMETERY, JACKSON, WY | 20	09/30/2025	23.30	23.30	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-010 09-	ELY SPRINGS RD WELL 6,7,8, J	09/30/2025	2,040.26	2,040.26	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-014 09-	135 E BROADWAY AVE HEAT TA	09/30/2025	20.30	20.30	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-017 09-	WASTE WATER TRTMT INTERM	09/30/2025	228.62	228.62	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-019 09-	RANGEVIEW DR LIFT PUMP CO	09/30/2025	70.75	70.75	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-021 09-	150 E PEARL AVE, JACKSON, W	09/30/2025	1,061.33	1,061.33	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-024 09-	1605 BERGER LN SEWER LIFT	09/30/2025	20.75	20.75	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-025 09-	450 W SNOW KING AVE NEW S	09/30/2025	485.92	485.92	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-026 09-	450 W SNOW KING AVE SHOP, J	09/30/2025	132.84	132.84	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-044 09-	610 SNOW KING DR ESTATES B	09/30/2025	316.40	316.40	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-047 09-	WASTE WATER TRTMT UV BLD	09/30/2025	38.00	38.00	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-049 09-	WASTE WATER TRTMT PTB 545	09/30/2025	15,916.52	15,916.52	10/08/2025

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
156	LOWER VALLEY ENERGY INC	92050-050 09-	2 MG TANK, JACKSON, WY | 200	09/30/2025	19.87	19.87	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-051 09-	WELL #5 KARNS MEADOW DR,	09/30/2025	3,394.85	3,394.85	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-052 09-	675 E BROADWAY AVE WELL #1	09/30/2025	1,289.78	1,289.78	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-053 09-	WELLS #2 & #3, JACKSON, WY	09/30/2025	4,576.49	4,576.49	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-054 09-	CITY WELL ELK REF 1, JACKSO	09/30/2025	6.34	6.34	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-055 09-	CITY WELL ELK REF 2, JACKSO	09/30/2025	6.34	6.34	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-056 09-	CITY WELL ELK REF 3, JACKSO	09/30/2025	6.34	6.34	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-059 09-	440 W SNOW KING AVE POLICE	09/30/2025	7.70	7.70	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-060 09-	400 W SNOW KING AVE S GAR,	09/30/2025	34.77	34.77	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-061 09-	400 W SNOW KING AVE PUBLIC	09/30/2025	79.60	79.60	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-074 09-	CRABTREE LN THAW WELL #2,	09/30/2025	27.02	27.02	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-075 09-	HIGH SCHOOL RD THAW WELL	09/30/2025	25.45	25.45	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-077 09-	685 E HANSEN AVE, JACKSON,	09/30/2025	74.49	74.49	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-078 09-	145 W HANSEN AVE FRONT, JA	09/30/2025	113.83	113.83	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-079 09-	145 W HANSEN AVE BACK, JAC	09/30/2025	76.26	76.26	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-082 09-	400 W SNOW KING AVE E STOR	09/30/2025	29.52	29.52	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-089 09-	685 E HANSEN AVE, JACKSON,	09/30/2025	10.40	10.40	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-090 09-	955 MAPLE WAY, JACKSON, WY	09/30/2025	66.69	66.69	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-092 09-	3150 S ADAMS CANYON DR ANI	09/30/2025	67.73	67.73	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-102 09-	145 W HANSEN AVE FRONT, JA	09/30/2025	6.34	6.34	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-105-382	MULTIPLE STREET LIGHTS	09/30/2025	2,795.04	2,795.04	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-106 09-	940 SIMON LN, JACKSON, WY |	09/30/2025	90.13	90.13	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-114 09-3	210 N CACHE ST HOME RANCH	09/30/2025	341.40	341.40	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-126 09-	SPRING WATER LN LIFT STATIO	09/30/2025	35.17	35.17	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-127 09-	3337 S CODY CREEK DR LIFT S	09/30/2025	157.73	157.73	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-131 09-	195 E DELONEY AVE RESTROO	09/30/2025	189.99	189.99	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-132 09-	160 S MILLWARD ST PARKING	09/30/2025	1,885.75	1,885.75	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-134 09-	160 S MILLWARD ST PARKING	09/30/2025	6.34	6.34	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-334 09-	JOSEPHINE LOOP LOT 15 LIFT	09/30/2025	77.08	77.08	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-341 09-	210 N CACHE ST HOME RANCH	09/30/2025	30.76	30.76	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-345 09-	930 SIMON LN, JACKSON, WY |	09/30/2025	78.90	78.90	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-356 09-	55 KARNS MEADOW DR START	09/30/2025	1,057.51	1,057.51	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-357 09-	55 KARNS MEADOW DR START	09/30/2025	1,270.03	1,270.03	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-359 09-	MILLER PARK PARKING LOT CH	09/30/2025	271.63	271.63	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-361 09-	625 W BROADWAY AVE NEW P	09/30/2025	177.51	177.51	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-363 09-	455 VINE ST UTIL, JACKSON, W	09/30/2025	47.51	47.51	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-364 09-	65 VIRGINIAN LN #5, JACKSON,	09/30/2025	38.76	38.76	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-365 09-	65 VIRGINIAN LN #7, JACKSON,	09/30/2025	61.10	61.10	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-367 09-	455 VINE ST APT #3, JACKSON,	09/30/2025	49.00	49.00	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-368 09-	455 VINE ST APT #4, JACKSON,	09/30/2025	53.51	53.51	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-370 09-	2022 WILDFLOWER CT, JACKS	09/30/2025	6.34	6.34	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-371 09-	2022 WILDFLOWER CT, JACKS	09/30/2025	29.45	29.45	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-374 09-	455 VINE ST APT #1, JACKSON,	09/30/2025	38.70	38.70	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-375 09-	155 E PEARL AVE, JACKSON, W	09/30/2025	24.34	24.34	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-376 09-	149 E PEARL AVE, JACKSON, W	09/30/2025	36.54	36.54	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-378 09-	145 E PEARL AVE #A EAST, JAC	09/30/2025	30.67	30.67	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-383 09-	SNOW KING DR WATER TANK C	09/30/2025	19.58	19.58	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-385 09-	85 N SPRING GULCH RD SPRIN	09/30/2025	166.19	166.19	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-388 09-	121 SHERWOOD CT BLDG 2 BU	09/30/2025	25.66	25.66	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-389 09-	1640 MARTIN LN LIFT STATION,	09/30/2025	24.53	24.53	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-390 09-	400 W SNOW KING AVE HOUSI	09/30/2025	219.04	219.04	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-391 09-	400 W SNOW KING AVE PARK M	09/30/2025	52.70	52.70	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-392 09-	400 W SNOW KING AVE ADMIN,	09/30/2025	344.00	344.00	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-393 09-	400 W SNOW KING AVE EMPLO	09/30/2025	388.39	388.39	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-395 09-	145 E PEARL AVE #C LOFT, JAC	09/30/2025	76.30	76.30	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-396 09-	145 E PEARL AVE HSE/CMN, JA	09/30/2025	84.36	84.36	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-397 09-	145 E PEARL AVE #B WEST, JA	09/30/2025	31.19	31.19	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-398 09-	155 E PEARL AVE, JACKSON, W	09/30/2025	59.39	59.39	10/08/2025

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
156	LOWER VALLEY ENERGY INC	92050-399 09-	155 E PEARL AVE, JACKSON, W	09/30/2025	52.32	52.32	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-401 09-	455 VINE ST APT #2, JACKSON,	09/30/2025	29.87	29.87	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-405 09-	3585 S CANADIAN DR, JACKSO	09/30/2025	125.89	125.89	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-406 09-	3585 S CANADIAN DR, JACKSO	09/30/2025	6.25	6.25	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-407 09-	130 E KELLY AVE #23, JACKSO	09/30/2025	40.18	40.18	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-411 09-3	1540 MARTIN LN H-FRAME MET	09/30/2025	22.91	22.91	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-416 09-	350 N MILLWARD ST #5, JACKS	09/30/2025	37.47	37.47	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-418 09-	355 W DELONEY AVE E-5, JACK	09/30/2025	48.06	48.06	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-419 09-	55 VIRGINIAN LN #4, JACKSON,	09/30/2025	60.86	60.86	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-420 09-	355 W DELONEY AVE A-5, JACK	09/30/2025	36.45	36.45	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-422 09-	126 ASPEN DR, JACKSON, WY	09/30/2025	46.30	46.30	10/08/2025
156	LOWER VALLEY ENERGY INC	92050-424 09-	69 VIRGINIAN LN #7, JACKSON,	09/30/2025	42.74	42.74	10/08/2025
	Total 156:				44,694.07	41,694.07	
7560	MACY, ERIC	100925	RELEASE BOND 24-0004 375 E	10/09/2025	6,000.00	6,000.00	10/09/2025
	Total 7560:				6,000.00	6,000.00	
7627	MADE IN IRON LLC	914	SQUARE TUBE	09/18/2025	268.60	.00	
	Total 7627:				268.60	.00	
7543	MASTERCARE CLEANING JH, L	2233	WINDOWS & PRESSURE WASH	09/30/2025	1,202.00	.00	
	Total 7543:				1,202.00	.00	
7738	MEAGHER, LUKE	100225	RESITUTION CASE 25-06-0209	10/02/2025	752.00	752.00	10/02/2025
	Total 7738:				752.00	752.00	
7739	MED-ENG, LLC	INV050-00833	FACE SHIELD KITS, FOOT PRO	09/25/2025	46,325.00	.00	
	Total 7739:				46,325.00	.00	
258	MENTAL HEALTH & RECOVERY	10012025	MENTAL HEALTH SERVICES OC	10/01/2025	45,250.00	.00	
	Total 258:				45,250.00	.00	
7388	MID-AMERICA RESEARCH CHE	0857779-IN	PRO-GUARD PLUS & DAZZLE C	08/28/2025	308.22	.00	
7388	MID-AMERICA RESEARCH CHE	0858752-IN	SURF DEGR	09/05/2025	151.96	.00	
	Total 7388:				460.18	.00	
4623	MSC INDUSTRIAL SUPPLY CO	7950430001	WASHERS, SCREWS, & BATTE	09/11/2025	232.38	.00	
	Total 4623:				232.38	.00	
257	NAPA AUTO PARTS INC.	338215	COUPLER	09/15/2025	46.58	.00	
257	NAPA AUTO PARTS INC.	339112	OIL FILTER & PANEL AIR ELEME	09/18/2025	48.54	.00	
257	NAPA AUTO PARTS INC.	339120	SOCKET	09/18/2025	51.61	.00	
257	NAPA AUTO PARTS INC.	339125	OIL PRESSURE SENSOR	09/18/2025	71.09	.00	
257	NAPA AUTO PARTS INC.	339162	MAXLIFE HM ATF & MULTI VEHI	09/18/2025	257.85	.00	
257	NAPA AUTO PARTS INC.	339164	OIL	09/18/2025	55.92	.00	
257	NAPA AUTO PARTS INC.	339263	AIR FILTER	09/18/2025	16.87	.00	
257	NAPA AUTO PARTS INC.	340190	FUEL FILTER	09/23/2025	15.15	.00	
257	NAPA AUTO PARTS INC.	340511	BATTERY & CABLE CONNECTO	09/24/2025	143.09	.00	
257	NAPA AUTO PARTS INC.	340724	METAL MARKER	09/24/2025	7.02	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
257	NAPA AUTO PARTS INC.	341177	FILTER	09/26/2025	11.33	.00	
257	NAPA AUTO PARTS INC.	342053	AIR & OIL FILTER	09/30/2025	87.41	.00	
257	NAPA AUTO PARTS INC.	342130	OIL PLUG	09/30/2025	8.12	.00	
257	NAPA AUTO PARTS INC.	342336	BATTERY CABLE CONNECTOR	10/01/2025	150.99	.00	
257	NAPA AUTO PARTS INC.	342522	RETURN OIL PRESSURE SENS	10/01/2025	71.09-	.00	
257	NAPA AUTO PARTS INC.	342651	OIL & AIR FILTER	10/02/2025	32.02	.00	
257	NAPA AUTO PARTS INC.	342774	OIL FILTER	10/02/2025	4.55	.00	
257	NAPA AUTO PARTS INC.	342839	OIL & AIR FILTER	10/02/2025	32.23	.00	
257	NAPA AUTO PARTS INC.	343879	LAMP	10/07/2025	11.38	.00	
257	NAPA AUTO PARTS INC.	343914	WIPER BLADES	10/07/2025	119.00	.00	
	Total 257:				1,099.66	.00	
187	NELSON ENGINEERING	68419	WATER & SEWER MODELING	10/01/2025	1,395.00	.00	
187	NELSON ENGINEERING	68421	ALLEY REPLACEMENT 25-243-0	10/01/2025	2,867.50	.00	
	Total 187:				4,262.50	.00	
7703	OUTBACK LANDSCAPE OF WY	55589	MOWING	09/30/2025	172.00	.00	
7703	OUTBACK LANDSCAPE OF WY	55590	MOWING	09/30/2025	354.00	.00	
	Total 7703:				526.00	.00	
4398	PALAZZOLO, MICHAEL	09172025	MONTHLY IT HARDWARE PMT	09/17/2025	77.83	.00	
	Total 4398:				77.83	.00	
7736	PEARSALL, ERIKA	100125	RELEASE BOND 25-0007 570 E	10/01/2025	5,000.00	5,000.00	10/01/2025
	Total 7736:				5,000.00	5,000.00	
5707	PERFORM PRINTING LLC	P1677	BUSINESS CARDS	09/30/2025	203.66	.00	
	Total 5707:				203.66	.00	
7242	PITTS, SAMANTHA	09292025	MONTHLY IT HARDWARE PMT	09/29/2025	77.83	.00	
	Total 7242:				77.83	.00	
7591	POINT S REXBURG	920000606	TIRES	09/19/2025	1,879.72	.00	
	Total 7591:				1,879.72	.00	
7090	PORT53 TECHNOLOGIES, INC	15765	XDR MONITORING & BREACH P	09/19/2025	35,574.00	.00	
	Total 7090:				35,574.00	.00	
7730	POST LAKE LENDING	10022025	J1P-012-05ET	10/02/2025	450.00	450.00	10/02/2025
	Total 7730:				450.00	450.00	
7723	PREMIER CLEANING SERVICES	25007	CLEANING	09/30/2025	1,820.00	.00	
7723	PREMIER CLEANING SERVICES	25007	CLEANING	09/30/2025	304.00	.00	
	Total 7723:				2,124.00	.00	
6483	PREMIER TRUCK- SALT LAKE C	775757593	EXTRUSION	10/02/2025	134.16	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
Total 6483:					134.16	.00	
7066	R & A SAFETY LLC	47376	DRUG SCREEN	09/02/2025	90.50	.00	
7066	R & A SAFETY LLC	47398	DRUG SCREEN	09/08/2025	90.50	.00	
7066	R & A SAFETY LLC	47413	DRUG SCREEN	09/12/2025	90.50	.00	
7066	R & A SAFETY LLC	47418	DRUG SCREEN	09/15/2025	90.50	.00	
7066	R & A SAFETY LLC	47449	DRUG SCREEN	09/19/2025	90.50	.00	
7066	R & A SAFETY LLC	47456	DRUG SCREEN	09/22/2025	90.50	.00	
7066	R & A SAFETY LLC	47494	DRUG SCREEN	09/19/2025	90.50	.00	
7066	R & A SAFETY LLC	47495	DRUG SCREEN	09/22/2025	90.50	.00	
7066	R & A SAFETY LLC	47502	DRUG SCREEN	09/25/2025	90.50	.00	
Total 7066:					814.50	.00	
1839	RAFTER J IMPROV/SERV DIST	4802	Quarterly Billing	10/01/2025	146.43	.00	
Total 1839:					146.43	.00	
7460	RAMANATHAN, BRINDA	110125	355 W Deloney A5 - November R	11/01/2025	2,500.00	.00	
Total 7460:					2,500.00	.00	
7341	RICH, SAMUEL	0930254794	PRYBAR	09/30/2025	76.00	.00	
7341	RICH, SAMUEL	1007255113	COMBO DRIVE & WRENCH SET	10/07/2025	282.50	.00	
7341	RICH, SAMUEL	1007255116	WRENCH SET, BEARING & SEA	10/07/2025	822.00	.00	
7341	RICH, SAMUEL	1007255117	DIAGONAL CUTTER	10/07/2025	100.00	.00	
Total 7341:					1,280.50	.00	
861	ROTARY CLUB OF JACKSON H	1964	QUARTERLY DUES TYLER SINC	10/01/2025	425.00	.00	
Total 861:					425.00	.00	
2669	SAFETY-KLEEN SYSTEMS, INC.	97757117	WASHER SOLVENT	09/13/2025	305.03	.00	
Total 2669:					305.03	.00	
7203	SCHWARTZ, ANDY	09292025	LOBBYING 3 OF 12	09/29/2025	5,000.00	.00	
Total 7203:					5,000.00	.00	
4359	SHERWIN-WILLIAMS CO.	7172-7	PAINT	10/01/2025	17.63	.00	
4359	SHERWIN-WILLIAMS CO.	8177-6	PAINT SPRAYER	09/18/2025	1,617.45	.00	
Total 4359:					1,635.08	.00	
4720	SILVERSTAR	OCT25-54639	CIRCUIT SERVICES	10/01/2025	2,755.55	.00	
4720	SILVERSTAR	OCT25-654791	INTERNET	10/01/2025	3,374.73	.00	
Total 4720:					6,130.28	.00	
7050	SOSA'S JANITORIAL SERVICE	0000196	JANITORIAL	09/01/2025	6,975.00	.00	
7050	SOSA'S JANITORIAL SERVICE	0000197	JANITORIAL	09/06/2025	675.00	.00	
Total 7050:					7,650.00	.00	
7713	Southern Tire Mart LLC	6550000509	TIRES	09/29/2025	9,088.41	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
7713	Southern Tire Mart LLC	6550000547	REFUND	10/02/2025	9,088.41-	.00	
7713	Southern Tire Mart LLC	6550000549	TIRES	10/02/2025	8,493.84	.00	
Total 7713:					8,493.84	.00	
7546	SPACE EXPLORATION TECHNO	INV-DF-USA-5	INTERNET	10/01/2025	660.00	.00	
Total 7546:					660.00	.00	
7623	SPERY, ALYSON	10072025	MOUNTAIN & RESORT TOWN P	10/07/2025	1,618.77	.00	
Total 7623:					1,618.77	.00	
7733	SPL HOUSING LLC.	092925	B19-0717 AND B20-0456 1120 S	09/29/2025	2,000.00	2,000.00	09/30/2025
7733	SPL HOUSING LLC.	092925	B19-0717 AND B20-0456 1120 S	09/29/2025	5,000.00	5,000.00	09/30/2025
Total 7733:					7,000.00	7,000.00	
6838	SPSC POA - South Park Services	10012025	WATER & LOT FEES	10/01/2025	303.82	.00	
Total 6838:					303.82	.00	
6871	STANDARD INSURANCE COMP	10102025	TOWN PORTION - LIFE, STD, LT	10/20/2025	9,456.61	9,456.61	10/10/2025
6871	STANDARD INSURANCE COMP	10102025-2	VOLUNTARY LIFE	10/20/2025	2,444.42	2,444.42	10/10/2025
Total 6871:					11,901.03	11,901.03	
4294	STATE FIRE IDAHO	12638957	ANNUAL SERVICE & LABELS	09/25/2025	506.00	.00	
4294	STATE FIRE IDAHO	12639759	ANNUAL FIRE SERVICE	09/30/2025	60.00	.00	
Total 4294:					566.00	.00	
7227	STEPHENS, TALON	09302025	MONTHLY IT HARDWARE PMT	09/30/2025	77.83	.00	
Total 7227:					77.83	.00	
7088	STONE, KIRK	110125	3585 Canadian • November Rent	11/01/2025	3,241.35	.00	
Total 7088:					3,241.35	.00	
5055	STOTZ EQUIPMENT	058705	FUEL PUMP	09/25/2025	115.50	.00	
Total 5055:					115.50	.00	
7740	SUPPLYHOUSE LLC	24251004	BOTTLE FILLER CONTROL BOA	09/23/2025	216.67	.00	
Total 7740:					216.67	.00	
7600	TCA INDUSTRIAL PARK ASSOCI	012925	GREGORY LANE EASEMENT	01/29/2025	900.00	900.00	10/10/2025
Total 7600:					900.00	900.00	
1740	TEGELER & ASSOCIATES	19562	NOTARTY BOND FOR SHELLIE	10/06/2025	1,600.00	.00	
Total 1740:					1,600.00	.00	
1443	TETON COUNTY CLERK	09302025	SEPTEMBER YEARLY PARKS &	09/30/2025	205,545.42	.00	
1443	TETON COUNTY CLERK	09302025-2	SEPTEMBER HOUSING CONTRI	09/30/2025	49,582.08	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
1443	TETON COUNTY CLERK	09302025-3	SEPTEMBER FIRE/EMS CONTR	09/30/2025	262,168.58	.00	
Total 1443:					517,296.08	.00	
581	TETON COUNTY INTEGRATED	11299	E WASTE DISPOSAL	09/18/2025	52.50	.00	
581	TETON COUNTY INTEGRATED	745672	YARD WASTE	09/02/2025	29.00	.00	
581	TETON COUNTY INTEGRATED	746889	YARD WASTE	09/08/2025	16.00	.00	
Total 581:					97.50	.00	
6902	TETON COUNTY PUBLIC WORK	12-NOV	SILSON TRANSIT CENTER FOR	09/26/2025	244,318.73	.00	
Total 6902:					244,318.73	.00	
614	TETON COUNTY TREASURER	01-001262 202	3500 SOUTH PARK 2025 PROPE	09/10/2025	8,431.18	.00	
614	TETON COUNTY TREASURER	OJ-000287 202	410 SCOTT LANE 2025 PROPER	09/10/2025	3,279.91	.00	
614	TETON COUNTY TREASURER	OJ-000327 202	145 WEST HANSEN 2025 PROP	09/10/2025	1,244.00	.00	
614	TETON COUNTY TREASURER	OJ-000327 202	145 WEST HANSEN 2025 PROP	09/10/2025	1,244.00	.00	
614	TETON COUNTY TREASURER	OJ-000327 202	145 WEST HANSEN 2025 PROP	09/10/2025	1,243.99	.00	
614	TETON COUNTY TREASURER	OJ-000327 202	145 WEST HANSEN 2025 PROP	09/10/2025	1,244.00	.00	
614	TETON COUNTY TREASURER	OJ-000665 202	940 SIMON LANE 2025 PROPER	09/10/2025	2,846.93	.00	
614	TETON COUNTY TREASURER	OJ-000955 202	955 MAPLE WAY 2025 PROPER	09/10/2025	2,443.12	.00	
614	TETON COUNTY TREASURER	OJ-001154 202	455 VINE STREET 2025 PROPE	09/10/2025	1,569.57	.00	
614	TETON COUNTY TREASURER	OJ-001154 202	455 VINE STREET 2025 PROPE	09/10/2025	1,569.57	.00	
614	TETON COUNTY TREASURER	OJ-001154 202	455 VINE STREET 2025 PROPE	09/10/2025	1,569.57	.00	
614	TETON COUNTY TREASURER	OJ-001154 202	455 VINE STREET 2025 PROPE	09/10/2025	1,569.57	.00	
614	TETON COUNTY TREASURER	OJ-001631 202	930 SIMON LANE 2025 PROPER	09/10/2025	2,683.57	.00	
614	TETON COUNTY TREASURER	OJ-005483 202	675 E HANSEN 2025 PROPERT	09/10/2025	6,404.63	.00	
614	TETON COUNTY TREASURER	OJ-005484 202	685 EAST HANSEN 2025 PROPE	09/10/2025	8,159.04	.00	
614	TETON COUNTY TREASURER	OJ-006074 202	155 E PEARL 2025 PROPERTY T	09/10/2025	33,130.14	.00	
614	TETON COUNTY TREASURER	OJ-007164 202	65 VIRGINIAN LANE 2025 PROP	09/10/2025	1,641.62	.00	
614	TETON COUNTY TREASURER	OJ-007166 202	65 VIRGINIAN LANE 2025 PROP	09/10/2025	1,640.50	.00	
Total 614:					81,914.91	.00	
1614	TETON COUNTY-FUND 10	10022025	EMERGENCY MGT SEPT 2025	10/02/2025	10,898.97	.00	
1614	TETON COUNTY-FUND 10	10072025	SEPT 2025 FUND 10 DISPATCH	10/07/2025	58,603.02	.00	
1614	TETON COUNTY-FUND 10	10072025-2	PATHWAYS SEPT 2025	10/07/2025	5,771.51	.00	
1614	TETON COUNTY-FUND 10	10092025	PLANNING SEPT 2025	10/09/2025	7,205.66	.00	
1614	TETON COUNTY-FUND 10	10092025	PLANNING SEPT 2025	10/09/2025	5,759.07	.00	
Total 1614:					88,238.23	.00	
268	TETON MOTORS INC	5114395 1	INDICATOR	09/29/2025	55.89	.00	
268	TETON MOTORS INC	5114407 1	CORE	09/30/2025	2,000.00-	.00	
268	TETON MOTORS INC	5114410 1	SENSORS	09/30/2025	94.96	.00	
268	TETON MOTORS INC	5114414 1	SENSOR RETURNED	09/30/2025	29.06-	.00	
268	TETON MOTORS INC	5114416 1	PUMP	09/30/2025	9.45	.00	
268	TETON MOTORS INC	5114417 1	FILTER & TRANSMISSION FLUI	09/30/2025	162.66	.00	
268	TETON MOTORS INC	5114441 1	ELEMENT	10/02/2025	64.95	.00	
268	TETON MOTORS INC	6176528/1	REPROGRAM CODES	09/30/2025	229.55	.00	
Total 268:					1,411.60-	.00	
3030	TETON VIEW LANDSCAPE CON	6483	CHIPSEAL YARD/SIDEWALK SW	06/30/2025	3,189.75	.00	
Total 3030:					3,189.75	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
3237	THE AFTERMARKET PARTS CO	83953222	AWNING LAMP, LIGHT & DECAL	09/11/2025	137.38	.00	
3237	THE AFTERMARKET PARTS CO	83961389	AIR BELLOW	09/16/2025	542.96	.00	
3237	THE AFTERMARKET PARTS CO	83961557	SHOCK ABSORBER	09/16/2025	836.12	.00	
3237	THE AFTERMARKET PARTS CO	83978145	LAMP KITS	09/24/2025	95.20	.00	
3237	THE AFTERMARKET PARTS CO	83978146	SHOCK ABSORBER	09/23/2025	340.48	.00	
3237	THE AFTERMARKET PARTS CO	83987766	LAMP KIT	09/30/2025	13.60	.00	
	Total 3237:				1,965.74	.00	
6810	THE TIRE RACK, INC.	PZ47405	TIRES	09/19/2025	4,207.84	.00	
	Total 6810:				4,207.84	.00	
3955	THOMSON WEST	852594546	ONLINE SUBSCRIPTION	10/01/2025	604.60	.00	
3955	THOMSON WEST	852594546	ONLINE SUBSCRIPTION	10/01/2025	604.60	.00	
	Total 3955:				1,209.20	.00	
6591	T-MOBILE	OCT25-967529	INTERNET	09/21/2025	31.35	.00	
	Total 6591:				31.35	.00	
7284	UCM DIGITAL HEALTH, INC	50613	OCTOBER 2025	10/01/2025	1,062.50	1,062.50	10/10/2025
	Total 7284:				1,062.50	1,062.50	
4649	ULINE	198265099	HAND DRYER	09/22/2025	900.00	.00	
	Total 4649:				900.00	.00	
706	USA BLUE BOOK	INV00835458	FILTER	09/22/2025	446.56	.00	
	Total 706:				446.56	.00	
1949	VERIZON WIRELESS	6122483443	cELL PHONES	09/01/2025	10,202.09	.00	
	Total 1949:				10,202.09	.00	
6319	VIRGINIAN VILLAGE CONDO H	1366	Q4 DUES	10/01/2025	675.00	.00	
6319	VIRGINIAN VILLAGE CONDO H	1366	Q4 DUES	10/01/2025	675.00	.00	
	Total 6319:				1,350.00	.00	
5022	VISION SERVICE PLAN - (WY)	823649180	OCTOBER 2025	09/17/2025	1,921.35	1,921.35	10/10/2025
	Total 5022:				1,921.35	1,921.35	
7743	WALKER, PAUL	10082025	PHYSICAL	10/08/2025	175.00	.00	
	Total 7743:				175.00	.00	
517	WAM	18408	WYOCMA FALL WORKSHOP - T	08/11/2025	125.00	.00	
517	WAM	18417	JONATHAN SCHECHTER NLC R	09/29/2025	1,155.00	.00	
	Total 517:				1,280.00	.00	
4848	WAMCO LAB, INC.	15161	DMRQA STUDY #45	09/29/2025	180.00	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
Total 4848:					180.00	.00	
7550	WBC PROPERTIES	110125	Virginian 69-7 - November Rent	11/01/2025	2,150.00	.00	
Total 7550:					2,150.00	.00	
472	WHITE GLOVE CLEANING, INC.	13216	JANITORIAL	09/30/2025	400.00	.00	
472	WHITE GLOVE CLEANING, INC.	13218	JANITORIAL	09/30/2025	800.00	.00	
472	WHITE GLOVE CLEANING, INC.	13219	JANITORIAL	09/30/2025	250.00	.00	
472	WHITE GLOVE CLEANING, INC.	13220	JANITORIAL	09/30/2025	125.00	.00	
Total 472:					1,575.00	.00	
6523	WHITE, AMANDA	10012025	NCVC TRAINING ORLANDO	10/01/2025	72.92	.00	
Total 6523:					72.92	.00	
3564	WILD THINGS	25066	SMARTCAP COMMERCIAL 21-2	09/19/2025	4,295.00	.00	
Total 3564:					4,295.00	.00	
6117	WILSON, JOHN	110125	Wildflower Court - November Rent	11/01/2025	2,200.00	.00	
Total 6117:					2,200.00	.00	
7742	WILSON, MICHELLE	09152025	TRAVEL CASELLE TRAINING	09/15/2025	183.00	.00	
Total 7742:					183.00	.00	
4493	WRIGHT, JASON	08082025	MONTHLY IT HARDWARE PMT	08/08/2025	77.83	.00	
4493	WRIGHT, JASON	09292025	MONTHLY IT HARDWARE PMT	09/29/2025	77.83	.00	
4493	WRIGHT, JASON	10022025	IT HARDWARE PAYOFF	10/02/2025	929.70	.00	
Total 4493:					1,085.36	.00	
6704	WSP USA INC.	40210771	STORMWATER MGT PROGRAM	06/13/2025	26,483.75	.00	
6704	WSP USA INC.	40247204	STORMWATER MGT PROGRAM	09/15/2025	18,060.88	.00	
Total 6704:					44,544.63	.00	
79	WYOMING DEPARTMENT OF E	10102025	3RD QTR SUTA	10/10/2025	4,272.56	4,272.56	10/10/2025
Total 79:					4,272.56	4,272.56	
4198	WYOMING FIRST AID & SAFETY	90001679	first aid kit resupply	10/07/2025	161.05	.00	
Total 4198:					161.05	.00	
406	WYOMING LAW ENFORCEMEN	10022025	OFFICER EDUCATION TRAININ	10/02/2025	80.00	.00	
Total 406:					80.00	.00	
329	WYOMING RETIREMENT SYST	274211, 27421	SEPTEMBER 2025 CONTRIBUTI	10/03/2025	216,541.30	216,541.30	10/03/2025
Total 329:					216,541.30	216,541.30	
1208	WYOMING SECRETARY OF STA	09302025	NOTARY APPLICATION FOR BR	09/30/2025	60.00	.00	

Vendor	Vendor Name	Invoice Number	Description	Invoice Date	Net Invoice Amount	Amount Paid	Date Paid
Total 1208:					60.00	.00	
1764	WYOMING.COM INC	2300142	DOMAIN HOSTING	10/06/2025	5.00	.00	
Total 1764:					5.00	.00	
2842	YELLOW IRON WASTE, LLC	250828293486	PAID TWICE	08/31/2025	546.00-	.00	
2842	YELLOW IRON WASTE, LLC	250930176482	TRASH	09/30/2025	45.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176658	TRASH	09/30/2025	45.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176787	TRASH	09/30/2025	55.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176794	TRASH	09/30/2025	680.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176801	TRASH	09/30/2025	220.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176803	TRASH	09/30/2025	220.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176878	TRASH	09/30/2025	220.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176880	TRASH	09/30/2025	210.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176925	TRASH	09/30/2025	388.00	.00	
2842	YELLOW IRON WASTE, LLC	250930176929	TRASH	09/30/2025	168.00	.00	
Total 2842:					1,705.00	.00	
Grand Totals:					2,197,128.42	369,562.28	

Dated: _____

Mayor: _____

City Council: _____

_____

_____

_____

_____

_____

City Recorder: _____

City Treasurer: _____

Report Criteria:
Detail report.
Invoices with totals above $0 included.
Paid and unpaid invoices included.

MUNICIPAL COURT, TOWN OF JACKSON – TETON COUNTY, WYOMING

Monthly Finance Report- September 2025

- During the month of September, the Court received $26,855.50 in fines, costs, and fees.
- 301 cases were closed. 59 (37 parking violations) of those cases were dismissed.
- 250 new cases were filed: 173 Parking Violations, 77 Traffic/Ordinance/Criminal summons.

The abbreviations used below can be defined as: BF= Bond Forfeiture (includes $10.00 court cost and fees), GP=Guilty Plea and Fine, NC= No Contest Plea and Fine, G=Found Guilty at Trial, DA=Deferred Adjudication, D=Dismissed, D-TS= Dismissed with Traffic School

CASES CLOSED in September (Parking offenses not listed):

CITATION	OFFENSE	DISPOSITION	$
186007864AC	Animals at Large	BF	100
01433M	Business license required	BF	250
186008030AC	Compulsory Auto Insurance	BF	280
186008044AC	Driver & Passenger Req. to wear seat belt	BF	25
186007716AC	Expired temporary permit/improper registration	BF	140
186007938AC	Improper Display of Tabs-registration	BF	90
186008048AC	Improper Display of Tabs-registration	BF	90
186007939AC	Limitations on Backing	BF	90
00311M	Limitations on Backing	BF	90
186007972AC	Open Container	BF	140
186007994AC	PATHWAY- Device not authorized on Pathway	BF	100
186007447AC	Public intoxication	BF	87.50
186008026AC	Public intoxication	BF	175
186007988AC	Public intoxication	BF	175
186007849AC	Public intoxication	BF	175
186007919AC	Public intoxication	BF	175
186007734AC	Public intoxication	BF	175
186007912AC	Public intoxication	BF	175
186007850AC	Public intoxication	BF	175
186007955AC	Public Urination	BF	120
186007770AC	Required to stop on flashing red signal	BF	90
186007952AC	Required to stop on flashing red signal	BF	90
186007943AC	Speeding 34/25	BF	103
186007944AC	Speeding 35/25	BF	105
186007840AC	Speeding 44/30	BF	130
186007940AC	Speeding 46/30	BF	140
186007643AC	Speeding 49/30	BF	155
186008015AC	Speeding 51/40	BF	115

186007775AC	Speeding 53/25	BF	200
186007928AC	Speeding urban - 44/30 mph zone	BF	188
186007540AC	Speeding urban - 45/30 mph zone	BF	195
186007969AC	Speeding urban - 47/30 mph zone	BF	209
186007920AC	Speeding urban - 47/30 mph zone	BF	209
186007929AC	Speeding urban - 48/30 mph zone	BF	216
186007974AC	Speeding urban - 48/30 mph zone	BF	216
186007921AC	Speeding urban - 49/30 mph zone	BF	223
186007925AC	Speeding urban - 50/30 mph zone	BF	95
186007990AC	Speeding urban - 51/30 mph zone	BF	267
186007841AC	Speeding urban - 60/30 mph zone	BF	330
186007879AC	Stop Sign Violation	BF	150
186007868AC	Stop Sign Violation	BF	140
186007915AC	Stop Sign Violation	BF	150
186007993AC	Stop Sign Violation	BF	140
186007883AC	Stop Sign Violation	BF	140
186006672AC	Stop Sign Violation	BF	150
186007884AC	Stop Sign Violation	BF	140
186007601AC	Unlawful Contact or Touching	BF	750
186008039AC	Unsafe Turning Movement	BF	90
186007956AC	Use of cell phone while driving prohibited	BF	75
186007881AC	Use of cell phone while driving prohibited	BF	75
186007976AC	Use of cell phone while driving prohibited	BF	75
186007830AC	Duty upon colliding with unattended vehicle or property	D- Per Town's Motion	0
186007918AC	Failure to stop at a red light	D- Per Town's Motion	0
186007885AC	False ID- minors- purpose of purchasing or entering	D- Per Town's Motion	0
186007847AC	Improper Display of Tabs-registration	D- Per Town's Motion	0
19372P	Interference w/PD: Resisting officer	D- Per Town's Motion	0
186007600AC	Interference w/PD: Resisting officer	D- Per Town's Motion	0
19371P	Public intoxication	D- Per Town's Motion	0
186007599AC	Public intoxication	D- Per Town's Motion	0
186007908AC	Use of handheld device to read, write, send/read text while driving	D- Per Town's Motion	0
186007893AC	Failure to Obey Traffic Control Device	D- TS	0
186007892AC	Failure to Obey Traffic Control Device	D- TS	0
186007538AC	Speeding 45/30	D- TS	0
186007845AC	Speeding 46/25	D- TS	0
186007821AC	Speeding urban - 47/30 mph zone	D- TS	0
98146N	Speeding urban - 48/30 mph zone	D- TS	0
186007970AC	Speeding urban - 49/30 mph zone	D- TS	0
186007763AC	Speeding urban - 54/30 mph zone	D- TS	0

186005497AC	1st off win 10 years-Drive/control veh under infl alcohol concentration 0.08% or more	DA- In accordance with WS 7-13-301	0
186005539AC	1st off win 10 years-Drive/control veh under infl alcohol concentration 0.08% or more	DA- In accordance with WS 7-13-301	0
98342N	Drive/control veh under infl alcohol concentration 0.08% or more	DA- In accordance with WS 7-13-301	0
98386N	Drive/control veh under infl alcohol concentration 0.08% or more	DA- In accordance with WS 7-13-301	760
98446N	Drive/control veh under infl alcohol concentration 0.08% or more	DA- In accordance with WS 7-13-301	760
01846M	Public indecency: indecent exposure	NC	0
01847M	Public indecency: indecent exposure	NC	0
186006345AC	Public indecency: indecent exposure	NC	0
19416P	Public intoxication	NC	0
186006906AC	Public intoxication	NC	0
186006755AC	Defacing or destroying property	NC, Restitution	1002

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Regular
Submitting Department:	Legal	**Presenter:**	Lea Colasuonno
Agenda Item:	Standard Contract Consideration for Approval	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is for the Council to review and consider contracts to which the Town of Jackson would be a party.

Requested Action.
Staff request that the Council review and consider the contracts included with the staff report.

Recommendations.
Staff recommend that the Council approve the contracts included with this staff report.

Background, **Analysis, and Key Policy Questions**.

1. Contract with Valley Springs Ranch
   - Purpose: On June 16, 2025, the Jackson Town Council approved a request by BCJ Enterprises, LLC, owners of the Valley Springs Ranch, to connect to the Town's sewer system. Part of the ranch is already connected to the Town's system, even though the connection has not been approved, as the trunk line to the sewer plant is adjacent to the property. Subsequent to the Town Council's June 16 approval, the property owner followed up timely with an application for the Sewer Connection and Use Agreement to formalize the connection in preparation for redevelopment of the ranch.
   - *Term:* For the duration of the sewer connection.
   - *Cost and Payment Terms:* The fee for a central system agreement is $828.
   - *Department & Budget Detail:* This item is for the Public Works Department. There are no budget requirements for this item.
   - *Notable Condition*: This approval is for a maximum amount of capacity up to 2500 gallons per day for the entire Valley Springs Ranch property. However, the current planned development will discharge less than 2500 gallons per day. In light of the discrepancy between maximum approval amount (2500 gallons per day) and the acknowledged lesser discharge, the applicant will pay capacity fees for only the amount of effluent they will discharge for the current planned development. The applicant is prohibited from discharging more effluent than they pay for, unless and until the applicant applies for, obtains, and pays for an increased discharge amount. Importantly, the discharge may never exceed the maximum authorized amount of 2500 gallons per day.

2. Special Restrictions for Affordable Rental Housing at The Loop Apartments – West Building (Contracts A, B and C).
   - *Purpose*: The purpose of this item is for the Town Council to consider Special Restrictions for Affordable & Workforce Rental Housing at The Loop Apartments. These units are required to be restricted to meet the housing mitigation and density bonus requirements (2 for 1 bonus + 4th floor bonus) for this development.
   - *Term*: The restrictions are perpetual. As a phased project, the Workforce Rental Restriction is only for units in the West building. Upon completion of the East building, but prior to issuance of its Certificate of

Occupancy, the Amended and Restated Workforce Rental Restriction, which includes all Workforce units from both buildings, will be recorded to replace the Workforce Rental Restriction for just units in the West Building so that a single restriction applies to all Workforce rental units on the site.

- *Cost and Payment Terms*: $0.00 to enter the Special Restrictions and the developer will pay all recording fees for this item.
- *Department & Budget Detail*: This item is for the Housing Department but has no budget implications and thus no line item.
- *Notable Conditions*: The restrictions use the template approved by Town Council in February 2023, with the following changes to reflect circumstances particular to this development and unit types:
    - Added "Affordable Rental," "Workforce Rental," or "Complete Amended and Restated Workforce Rental" to document title.
    - Changed "Rules & Regulations" in Whereas section to "defined below" so that its only defined once in each document.
    - In Amended and Restated restriction, added three Whereas statements 1) identifying the previously recorded restriction only for units in the West Building, 2) noting that Section 4.2 of the previously recorded restriction allows for it to be amended, and 3) amend, restate and replace previously recorded restriction with this restriction.
    - Added "there is no maximum income or asset limit for Qualified Households" to Sec 1.1.2 of the Workforce restrictions to codify basic element of the program.
    - Deleted Sec. 1.3 Ownership by Housing Department because these units are all rentals and nothing in the restrictions or in the Rules & Regulations prohibits Housing Dept from owning.
    - Added, "unless otherwise explicitly provided herein" to Sec. 2.1 Rules and Regulations Applicability to clarify that Restriction terms supersede Rules & Regs if found to be in conflict.
    - Deleted Sec. 2.5 Capital Improvements because doesn't apply to rentals.
    - Added "Declarant shall set the rental rate. There is no cap on rent or rent appreciation" to Sec. 2.9 of the Workforce restrictions to codify basic element of the program.
    - Added "with Declarant's knowledge" to fraud definition for misrepresentation by occupant.
    - Changed Sec 5.1.4 to delete details of the Purchase Option and Forced Sale breach remedies and replace with requirement that these additional remedies be added to the updated restriction that gets recorded if the units are subdivided/condominiumized.
    - Changed effective date definition to date the restriction is recorded.
    - Changed "Owner" reference in signature block to "Declarant" and added "a Delaware limited liability company."

3. Primary Lease Agreement with Teton County (Adams Canyon Winter Employee Housing)

- *Purpose*: This primary lease agreement will secure winter housing for START seasonal transit operators at the Adams Canyon facility. Winter housing begins November 1, 2025 when seasonal workers arrive and ends April 13, 2026 when the START winter schedule ends. This facility is comprised of seven bedrooms, three bathrooms, and shared kitchen and laundry areas. This will provide housing for seven START winter seasonal transit operators.
- *Term*: November 1, 2025-April 13, 2026
- *Cost and Payment Terms:* The Town pays rent to Teton County in the amount of $878 per bedroom, per month ($6,146 per month for the Term), and $100 per month to Yellow Iron for trash removal (approximately $500 for the Term).

- *Department & Budget Detail*: This item is for the START Department and is included in the Departmental budget for the housing line item.

4. Contract with Salt Lake Express (SLE)

- *Purpose*: The purpose of this item is to request Town Council approval to execute a new Bus Storage Lease Agreement between the Town of Jackson and Western Trails Charter and Tours, dba Salt Lake Express ("SLE") to park SLE buses at the START operations facility ("Lease"). This would occur as part of START's agreement with SLE to provide contracted public bus service on behalf of START during the 2025-2025 winter season.
- *Term*: November 16, 2025 to April 14, 2026
- *Cost and Payment Terms*: SLE will pay START $20 per day per bus (up to three buses) to park at the START Facility. SLE invoices START monthly. In the invoice SLE adjusts/reduces the invoice by the amount of the lease for parking for that month.
- *Department & Budget Detail*: This item is for the START Department and is included in the Departmental budget for TV Shuttle – Salt Lake Express.

5. Termination of Original Revocable License for Chairlift Seating and Approval of a New Revocable License for Chairlift Seating – Home Ranch

- *Purpose*: The purpose of this item is to seek Council approval for 1) Termination of the original Revocable License for Chairlift Seating Agreement and 2) approval of a new Revocable License Chairlift Seating Agreement for the installation of refurbished chairlifts for the Summit Connector Chair Placemaking Project at Home Ranch. Staff request termination of the original license agreement because the chairlifts were installed in a different location than the one described in the exhibit to the original agreement. In order to remedy this problem, staff is proposing a new Revocable License for Chairlift Seating Agreement that includes a new exhibit that references where the chairlifts were actually installed.
- *Term*: The term of this agreement runs from its execution until December 31, 2038.
- *Cost and Payment Terms*: $0.00. The costs for the chairlift refurbishment and installation were paid by Jackson Hole Public Art.
- *Notable Condition*: Notable conditions of this Agreement are the initial cost and long-term maintenance for the project. Jackson Hole Public Art, as the licensee, is responsible for installing, constructing, inspecting, repairing, maintaining, removing, replacing, and reinstalling the chairlift seat, which includes snow removal from the area being licensed to Jackson Hole Public Art.

6. Contract with Jackson Hole Public Art

- *Purpose*: The purpose of this item is to seek Council approval of a First Amendment to the Social Service Contract Between the Town of Jackson and Jackson Hole Public Art ("JHPA") to amend the description of JHPA's services for fiscal year 2025-2026 to include its administration and oversight of Town's 2024 National Endowment of the Arts public art grant for the Stilson Transit Center ("Grant"). During fiscal year 2024-2025, JHPA provided Grant administration services and it was the parties intention to continue these thru the current fiscal year. The First Amendment clarifies this.
- *Term*: Town of Jackson Fiscal Year 2025-2026.
- *Cost and Payment Terms*: $0.00. These services were included in the scope of JHPA's services for current fiscal year.
- *Department & Budget Detail*: This item is for the Administration Department but has no budget implications and thus no line item.

7. Contract with Zift for Merchant Processing
- *Purpose*: The purpose of this item is to approve a merchant processing agreement with Zift. Zift is a payment processor that administers electronic credit card and debit card transactions. The Finance department is using an online portal to process business license renewals for the third year. The online portal was upgraded and now requires Zift to be the merchant processor. Zift rates are comparable to Chase Paymentech, the prior merchant processor. With this transition to Zift, a convenience fee of 2.55% will be assessed on transactions processed thru the portal.
- *Term*: Effective upon Mayor's signature. Automatically renews on a monthly basis until Town or Zift terminate service.
- *Cost and Payment Terms*: $600 setup fee due on effective date. 3.00% per transaction paid on a monthly basis with 2.55% of the fee paid by the customer.
- *Department & Budget Detail*: This item is for the Finance Department and is included in the Departmental budget for the Credit Card Fee line item.

The key policy question with respect to each contract listed above is whether the Town Council approves of the agreement as presented by staff.

Possible Alternatives.

For each contract included with the staff report the Council has the option to:

A. Direct staff to negotiate different terms or conditions with the contracting party.
B. Not to enter the contract.

Comprehensive Plan & Priority Alignment.

Section 8.1 and 8.2: Timely, efficiently, and safely deliver quality services and facilities in a fiscally responsible and coordinated manner.

Fiscal Impact.

The fiscal impact for each contract is set forth above.

Staff Impact.

The primary impact on staff for contracts falls in the Legal Department, and averages 3 hours for each contract. Secondary impacts on staff for contracts are felt in each department to which the contract is relevant, and averages two hours for each contract.

Attachments or Links.

The contracts in the order listed above are attached to the staff report as follows:

1. Contract with Valley Springs Ranch
2. Special Restrictions for Affordable Rental Housing at The Loop Apartments – West Building
3. Primary Lease Agreement with Teton County (Adams Canyon Winter Employee Housing)
4. Contract with Salt Lake City Express (SLE)
5. Termination of Original Revocable License for Chairlift Seating and Approval of a New Revocable License for Chairlift Seating – Home Ranch
6. Contract with Jackson Hole Public Art
7. Contract with Zift for Merchant Processing

Suggested Motion.

1. I move to approve the Contract with Valley Springs Ranch, subject to minor changes by staff.
2. I move to approve the Special Restrictions for Affordable Rental Housing at The Loop Apartments – West Building, subject to minor changes by staff.
3. I move to approve the Primary Lease Agreement with Teton County (Adams Canyon Winter Employee Housing), subject to minor changes by staff.
4. I move to approve the Contract with Salt Lake City Express (SLE), subject to minor changes by staff.
5. I move to approve the Termination of Original Revocable License for Chairlift Seating and Approval of a New Revocable License for Chairlift Seating – Home Ranch, subject to minor changes by staff.
6. I move to approve the Contract with Jackson Hole Public Art, subject to minor changes by staff.
7. I motion to approve the Contract with Zift for Merchant Processing, subject to minor changes by staff.

WASTEWATER TREATMENT FACILITIES CONNECTION AND USE AGREEMENT BETWEEN THE TOWN OF JACKSON AND BCJ ENTERPRISES, LLC (VALLEY SPRINGS)

This Wastewater Treatment Facilities Connection and Use Agreement ("**Agreement**") is made between the Town of Jackson, a municipal corporation of the State of Wyoming, of P.O. Box 1687, Jackson, WY 83001 ("**Utility**") and BCJ Enterprises LLC, a _____LLC, of 1375 Valley Springs Road, Jackson, WY 83001-7915 ("**Customer**").

RECITALS

WHEREAS, Utility is the owner and operator of a wastewater treatment plant and associated facilities, including wastewater collection and interceptor mains (the "**Utility Wastewater System**"), and by means of these facilities makes wastewater collection and treatment services available to residents of the Town of Jackson and, in some instances, to adjacent or nearby areas of Teton County, Wyoming; and

WHEREAS, the Town of Jackson Municipal Code, as amended, provides that Utility has exclusive control and management of the Utility Wastewater System provided to all users within the Town of Jackson and those voluntarily electing to connect, but lying outside the corporate limits of the Town of Jackson, and has the authority, from time to time, to make such rules and regulations as are necessary for the complete management and control of the Utility Wastewater System; and

WHEREAS, Town of Jackson Municipal Code, as amended provides, further, that Utility shall not be responsible for the maintenance, repair, or operation of sewer services, service laterals, or any of their appurtenant elements extending from the outside diameter of the Utility Wastewater System to the point of use; and

WHEREAS, Customer owns Parcel A located in PT W1/2 SW1/4, SEC 8, PT SE1/4 SE1/4, SEC 7, TWP 40, RNG 116, PARCEL A, (MOS T-317F) and is addressed as 1375 Valley Springs Road, Jackson, Wyoming, commonly known as the Valley Springs Ranch (the "**Property**"), which is located outside the Town of Jackson's corporate limits; and

WHEREAS, currently, wastewater from the Property is managed by a combination of a private septic system for one structure and an unformalized connection to the Utility's Wastewater System for the remaining structures; and

WHEREAS, Customer intends to further develop the Property subject to the necessary approvals of Teton County and wishes to install a sewer collection and conveyance system on the Property (the "**Customer Wastewater System**") in order to bring the existing connection to the Utility Wastewater System into compliance with the Utility's outside user policy and permitting process, and to allow approved future development on the Property to connect to the Utility Wastewater System; and

WHEREAS, on June 16, 2025, the Jackson Town Council voted to approve Customer's application to connect the Property to the Utility Wastewater System, specifically for capacity up to 2500 gallons per day for the entire Property, including, but not limited to, the existing non-compliant connection to the Utility Wastewater System ("**Approved Capacity**"), all as more particularly described and set forth in Exhibit 1, subject to conditions of approval, all of which is memorialized in the public record; and

WHEREAS, it is acknowledged and agreed by the parties that Customer's development application(s) to Teton County, Wyoming for the Property comprise buildings, structures, and uses (or a combination thereof) that require the discharge of less than 2500 gallons per day of wastewater ("**Authorized Development**"); and

WHEREAS the purpose of this Agreement is to formalize procedures between Utility and Customer for sewer connection and wastewater treatment, memorialize the discharge limits of the Authorized Development on the Property vis-à-vis the Approved Capacity, memorialize the requirement for additional application(s) and approval(s) from the Utility prior to Customer increasing is effluent discharge; and to clarify the terms and conditions under which any owner of property that is not within the Property (an "**Outside Party**") may connect to the Utility Wastewater System through the Customer Wastewater System;

NOW THEREFORE, in consideration of the foregoing Recitals, which expressly are hereby made a part of this Agreement, it is hereby agreed by and between the parties as follows:

1. Connection to the Utility Wastewater System.
   A. Permission to Connect Customer Wastewater System
      i. Utility hereby authorizes Customer to connect the Customer Wastewater System to the Utility Wastewater System, as more particularly described and set forth in Exhibit 1, attached hereto and made a part hereof by this reference.
      ii. This Agreement is exclusive to the one connection set forth in Exhibit 1. Customer has no right to additional wastewater connections for itself nor to increase its wastewater connection service size.
      iii. Customer has no right to wastewater connections for Outside Parties, nor may it allow any Outside Party to tap into the Utility Wastewater System, nor allow any Outside Party to connect to the Customer Wastewater System as a means of connecting to the Utility Wastewater System. Connections by an Outside Party to the Customer Wastewater System requires obtaining express, advance, written permission for connection from both the Utility and Customer.
   B. It is understood and agreed by the parties hereto that the Property is one customer and that Customer is the party responsible for the wastewater that is directly or indirectly discharged into the Utility Wastewater System via the Customer Wastewater System and for the obligations of this Agreement.

2. Wastewater Discharge Limit and Requirement for Additional Approvals to Exceed Approved Capacity.
   A. This Agreement authorizes Customer to discharge a maximum of up to 2500 gallons per day of wastewater from the Property and, pursuant to the June 16, 2025 Town Council approval, the effluent discharged from the Property may never exceed this Approved Capacity.
   B. However, the parties agree that Customer will pay capacity fees for only the amount of effluent discharged by the Authorized Development on the Property and that Customer is prohibited from discharging more effluent than they pay for unless and until Customer:
      i. Applies to increase its effluent discharge for an amount up to a maximum of the Approved Capacity; and
      ii. Obtains written approval from the Town Engineer for such increased effluent discharge; and
      iii. Pays all required fees and/or charges for such increased effluent discharge.

3. Agreement to Treat Wastewater.
   A. Utility hereby agrees to provide sanitary sewer services to Customer for the Property for the Approved Capacity pursuant to the terms and conditions set forth herein, ordinances of the Town of Jackson, and the Wyoming State Statutes.
   B. Notwithstanding the foregoing, the Utility may, in its sole discretion, interrupt or reduce wastewater treatment service due to:
      i. System emergencies; or

ii. In order to install equipment, make repairs, replacements, investigation, and inspections; or
iii. Perform maintenance work on the Utility Wastewater System.

4. Customer Responsibilities.
   A. Customer is solely responsible for paying all costs and expenses associated with the design, construction, use, operation, maintenance, and repair of the Customer Wastewater System, as well as all costs of connecting and maintaining the connection of the Customer Wastewater System to the Utility Wastewater System.
   B. Customer must apply for, receive, and maintain compliance with all necessary permits to construct and operate the Customer Wastewater System from the Wyoming Department of Environmental Quality ("DEQ") prior to and for the duration of its connection to the Utility Wastewater System (the "DEQ Permit"). The DEQ Permit does not relieve Customer from any duty to obtain and maintain any other permit or authorization that may be required by any provision of federal, state, or local codes and ordinances; nor does it permit violation of any section of federal, state, or local codes and ordinances.
   C. In the event of any damage, infiltration, contamination, or intrusion to the Customer Wastewater System, Customer shall promptly notify the Utility of the event; advise the Utility of the measures Customer is taking to remedy the problem(s); complete all repairs within a reasonable timeframe; and notify the Utility when all such repairs have been completed.
   D. Should the Utility be notified by state or federal agencies with jurisdiction over the Utility Wastewater System, that the Customer Wastewater System or this Agreement is out of compliance with law, regulations, permits, reporting, or deficient in a like way, Customer shall timely and fully cooperate with the Utility to remedy the compliance or deficiency issue, up to and including, disconnection. All parties shall pay the costs for their own systems.
   E. In the event of a request by an Outside Party to connect to the Utility Wastewater System through the Customer Wastewater Conveyance System, the following shall apply:
      i. Customer will, as a condition of its approval of the connection, require the Outside Party to contract with a Wyoming licensed professional engineer, or approved equivalent consultant, to conduct a capacity study. The capacity study is intended to evaluate: (i) the total additional potential area, defined for the purposes of this section as the area that the Outside Party is requesting to be served by the Customer Wastewater Conveyance System (the "Additional Service Area"), whether that full usage is implemented at the time of connection or thereafter; and (ii) the likely impact(s) of the requested connection on the Utility Wastewater System and the Customer Wastewater Conveyance System by the Outside Party.
      ii. Customer shall require the Outside Party to use in its study the same methodology as that employed by the Town 2020 Capacity Study, or such other methodology approved by the Town, as may be updated by the Town from time to time.
      iii. Prior to the connection being allowed, the Outside Party shall file an application with Customer, according to its independent process, and, if approved by Customer, shall then file an application as supplied and directed by the Utility. If approved by both Customer and the Utility, the Outside Party shall execute agreements with Customer and the Utility, respectively.
      iv. Nothing in this Agreement shall prevent Customer from rejecting a connection request by an Outside Party. Customer, at its sole discretion, reserves the right to deny an Outside Party's connection request for any or no reason, including but not limited to, the findings of the capacity study.

5. Wastewater Rates, Charges, and Fees.
   A. The wastewater rates, charges, and fees for Customer shall be in accordance with the standard service policies and user rates established by the Utility via ordinance and in accordance with Wyoming State

Statutes, including that wastewater rates, charges, and fees are subject to change, and the changes thereto are applicable to Customer.

B. It is acknowledged and agreed that the Property is outside the Town of Jackson corporate limits, and consistent with Wyoming State Statutes, Customer may be subject to different rates, charges, and fees than those within the corporate limits of the Town.

C. *Wastewater Capacity Fee*.

   i. *Initial Connection Authorized Development.* Prior to connection to the Utility Wastewater System, Customer must pay a non-refundable Wastewater capacity fee for the initial connection to the Authorized Development that runs with the land. Such capacity fee will be paid in accordance with Jackson Municipal Code in effect at the time the Town issues the permit for such connection.

   ii. *Additional Development*. If in the future the Property is approved for development in addition to the Authorized Development and that additional development requires additional connection(s); or Customer seeks to increase its wastewater connection service size; or more volume than approved herein (2,500 gallons per day) is used per month, Customer will be assessed additional Wastewater capacity fees, which fee will be paid in accordance with the Jackson Municipal Code in effect at the time the Town issues the permit for such connection.

D. *Wastewater Line Service Costs (Connection Costs)*. Prior to and during connection to the Utility Wastewater System, Customer may be charged costs to connect to or tap into the Utility Wastewater System. Such costs will be paid in accordance with the Jackson Municipal Code, as it may be amended from time to time, at the time the Town issues the permit for such connection.

E. *Recurring Wastewater Rates.* Customer will pay wastewater rates consistent with the Jackson Municipal Code and the adopted fee schedules of the Town of Jackson, as each may be amended from time to time.

   i. *Metering.* All water supplied to buildings connected to the Town's system shall be metered utilizing meters procured from the Town. Individual metering/billing of each building within the Authorized Development shall be the responsibility of Customer. When automatic readings by the Utility are not possible Customer shall be responsible for reading the meters and conveying that reading to the Utility monthly. The Utility retains the right, and is granted access to the Property, to read the meters at reasonable times. Customer may be required by Utility to meter or verify wastewater volumes by direct wastewater discharge metering.

F. *Invoicing*.

   i. Customer is responsible for billing, if any, individual units on the Property.

   ii. Invoicing for Customer will commence at such time as the Customer Wastewater System is installed but charges will not be incurred until actual use commences.

   iii. The Utility will regularly prepare an invoice to Customer for wastewater services for the Property as a single customer. Regardless of Customer's invoicing individual units on the Property for Customer Wastewater System services, Customer shall be the only customer of the Town.

   iv. Pursuant to Wyoming State Statutes, in the event Customer fails to pay an invoice within thirty (30) days after it is due, the amount thereof, together with a penalty of 10%, and a reasonable attorney's fee, may be recovered in a civil action by the Utility.

   v. Utility's billing may include surcharges for extraordinary strength wastes in accordance with the Town of Jackson ordinances, resolutions, and regulations for wastewater.

6. Design and Construction.

A. Customer shall employ a Wyoming licensed professional engineer for the design and permitting of the Customer Wastewater System. Prior to construction Customer shall submit engineer stamped reports, plans, specifications, and calculations related to Customer Wastewater Conveyance System design for Utility review and approval.

B. The design must provide a metering manhole with a manufactured flume or other configuration acceptable to the Utility at or near the point of connection to the Utility Wastewater System. This metering manhole will be used by the Utility or Customer to verify wastewater volumes.

C. The construction and quality control testing shall be monitored by a Wyoming licensed professional engineer responsible for verifying that construction conforms to the project plans and specifications. Inspection reports and test results shall be submitted to the Utility as required by the permit, and prior to the Town Engineer's final inspection.

D. Record drawings shall be submitted electronically in Portable Document Format (PDF) with a corresponding AutoCAD compatible file depicting the improvements and property boundaries, GIS Shape files with metadata and in any other format deemed suitable by the Town Engineer. Customer has an ongoing obligation to update the record drawings and the corresponding AutoCAD compatible files depicting the improvements and property boundaries timely.

E. Customer is solely responsible for construction of the Customer Wastewater System to the point of connection to the Utility Wastewater System.

F. Customer shall follow the more stringent of the International Plumbing Code, DEQ, or the Utility's standards that apply to applicable construction, as reasonably interpreted by the Town Engineer. The Utility shall be contacted and will complete a final inspection of the new system installation prior to any discharge to the Utility's Wastewater System by the new Customer Wastewater System.

G. It is understood by the parties that Customer may modify the Customer Wastewater System provided prior notice is given to Utility in accordance with paragraph 6.C. below and that Utility may require modifications to the system to be approved by permit.

7. Inspections and Notifications.

A. Upon reasonable notice to Customer, which notice shall include reasonable proof of contamination, infiltration, wastewater strength, intrusion, the Utility may require inspection and testing by Customer of the Customer Wastewater System for the purpose of investigating contamination, infiltration, wastewater strength, or intrusion and providing a report by a Wyoming licensed professional engineer. Such testing and inspection pursuant to this paragraph shall be at Customer's expense.

B. Upon reasonable notice to Customer, the Utility shall be granted access to the Customer Wastewater System for the purpose of inspecting and testing the infrastructure, and for the purpose of monitoring the wastewater flow and strength. All such testing shall be at the Utility's expense.

C. Customer shall notify the Utility prior to any modifications to the Customer Wastewater System.

D. Utility shall have not less than two business days' notice to inspect all new connections or modifications to the Customer Wastewater System. The Utility, by such inspection, shall not be responsible for any aspect of any new or modified line, without limitation.

8. Septic, Hazardous, and Unapproved Materials Prohibited.

A. Septic system waste, hazardous materials, or other unapproved substances shall not be introduced into the Customer Wastewater System or the Utility Wastewater System without prior written approval from the Town Engineer.

9. Customer Voluntary Termination.

A. Customer has the right to voluntarily terminate this Agreement at any time upon six (6) months' written notice to the Utility of its intent to terminate. At the expiration of the notice period, Customer shall disconnect the Customer Wastewater System from the Utility Wastewater System within thirty (30) days. Customer shall notify the Utility in writing of the date disconnection occurred and shall be responsible for all costs associated with the physical termination and disconnection from the Utility Wastewater system. If Customer disconnects prior to the expiration of the notice period, Customer will be charged the base charge until the expiration of the notice period.

10. Annexation.
    A. Customer shall not object to annexation of the Property conducted in accordance with State Statutes and will cooperate with the Town in the process of such annexation.
    B. It is acknowledged and agreed by the parties that notwithstanding such annexation, the Customer Wastewater System shall remain owned by Customer and, in accordance with the terms of conditions herein, shall solely, at its cost, be operated, maintained, repaired, and replaced by Customer.

11. Liability; Indemnifications.
    A. Utility shall not have any responsibility or liability for construction, maintenance, or repair of any portion of the Customer Wastewater System.
    B. Customer agrees to indemnify and hold harmless the Town from and against any and all cost, liability, expense, and cause of action resulting from Customer's operation of, or its failure to maintain or repair any portion of, the Customer Wastewater System, its violation of any regulatory agency's rules and regulations applicable to the Customer Wastewater System, the imposition of fines and/or legal costs to the Utility associated with such violation, and for costs related to damages resulting from any improper discharge into the Utility Wastewater System by Customer, which indemnification includes all costs of defense (including reasonable attorney's fees) for any action or proceedings in which the Utility becomes a party as a result thereof.
    C. In the event that performance of this Agreement is prevented, or interrupted, or service is interrupted or discontinued to Customer for any reason beyond control of the Utility, Customer agrees that there shall be no responsibility or liability on the part of the Utility for failure to perform or provide such service.

12. Violation; Enforcement.
    A. Customer hereby acknowledges that a violation of Title 13 of the Jackson Municipal Code constitutes a violation of this Agreement and may be enforced pursuant to the remedies available in this section.
    B. This Agreement may be enforced by either party by an action at law or in equity, specifically including extraordinary remedies of specific performance and injunctive relief. In the event a party shall be required to bring an action to enforce its rights pursuant to this Agreement, the prevailing party in such controversy shall be entitled to recover, in addition to any and all other relief, all costs, including a reasonable sum for attorney's fees incurred.

13. Notice.

    Any notice, request, demand, consent, approval, or other communication required or permitted under this Lease shall be in writing and shall be deemed duly given (i) when delivered personally to the recipient, (ii) when sent by certified mail, return receipt requested, to the address specified below, or (iii) when sent by email to the email address specified below, provided that the sender has not received a delivery failure notification. A notice sent by email shall be deemed received on the date and time the email is sent, provided that (a) the email is sent to the recipient's designated email address as set forth below, (b) the sender does not receive a bounce-back or delivery failure notification, and (c) if the notice is sent outside of normal business hours (9:00 AM to 6:00 PM on business days), the notice shall be deemed received at 9:00 AM on the following business day. Either party may change its address or email address for notice purposes by providing written notice to the other party in accordance with the terms of this provision.:

Town:	Customer:
Town of Jackson	BCJ Enterprises, LLC
Attn: Town Clerk	Attn: _____
P.O. Box 1687	P.O. Box _____

Jackson, Wyoming 83001	Jackson, WY 83001
clerk@jacksonwy.gov	email_____

14. Miscellaneous Provisions.
    A. *Entire Agreement; Amendment.* The parties agree that this Agreement reflects the entire agreement between the parties as to the subject matter hereof and may be amended anytime by agreement of the parties, which shall be effective when in writing and duly executed by both parties.
    B. *Waiver.* A waiver by either party regarding the breach of any of the provisions of this Agreement shall not bar the right of the other party to enforce the terms of this Agreement.
    C. *Assignment.* This Agreement shall not be assigned or transferred.
    D. *Binding Effect.* This Agreement shall be binding upon and inure to the benefit of the parties hereto, their heirs, legal representatives, successors, and permitted assigns unless terminated upon written agreement by the parties, or their heirs, legal representatives, and successors.
    E. *Recordation.* Customer shall, at its expense, record this Agreement or a Memorandum of Agreement in the land records of the Office of the Teton County Clerk, Teton County, Wyoming against the Property being served by the Utility.
    F. *Recitals Part of Agreement.* The representations, covenants and recitations set forth in the Recitals are material to this Agreement and are hereby incorporated into and made a part of this Agreement as though they were fully set forth herein.
    G. *Severability.* If a court finds any provision of this Agreement to be invalid or unenforceable, such finding shall not render the entire Agreement void or unenforceable. If feasible, the offending provision shall be deemed modified within the limits of enforceability or validity. If the offending provision cannot be modified, it shall be stricken and all other provisions of this Agreement in all other respects shall remain valid and enforceable.
    H. *Additional Documents and Acts*. Each party agrees to execute and deliver such additional documents and instruments and to perform such additional acts as may be necessary or appropriate to effectuate, carry out and perform all of the terms, provisions, and conditions of this Agreement and the transactions contemplated hereby.
    I. *Counterpart Signature.* This Agreement may be executed simultaneously in two or more counterparts, each of which shall be deemed an original and all of which, when taken together, constitute one and the same document. The signature of any party to any counterpart shall be deemed a signature to, and may be appended to, any other counterpart.
    J. *Governing Law, Jurisdiction, Construction*. This Agreement shall be construed, performed, and enforced in accordance with, and governed by, the laws of the State of Wyoming, without giving effect to the principles of conflict of laws thereof. The parties hereto irrevocably elect as the sole judicial forum for the adjudication of any matters arising under or in connection with this Agreement, and consent to the jurisdiction of, the courts of the County of Teton, State of Wyoming, or the United States of America for the District of Wyoming. This Agreement was negotiated by both parties hereto. As such, it shall not be construed against or in favor of any party by virtue of which party drafted it or any portion thereof.
    K. *Immunity*. The Utility does not waive its governmental immunity by entering into this Agreement, and fully retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of this Agreement.

IN WITNESS WHEREOF, this Agreement shall be effective as of the last date signed below.

BCJ Enterprises, LLC,

A Duly Organized LLC
of the State of _____

_____
By: _____

Its:_____

Dated:_____

STATE OF WYOMING)
) ss.
COUNTY OF TETON)

The foregoing instrument was acknowledged before me by _____, acting as its _____, this ___ day of _____, 2025.

Witness my hand and official seal.

_____
Notary Public

My commission Expires:

TOWN OF JACKSON,

A municipal corporation
of the State of Wyoming

_____
BY: Arne O. Jorgensen, Mayor

DATE:_____

_____
ATTEST: Riley Hovorka, Town Clerk

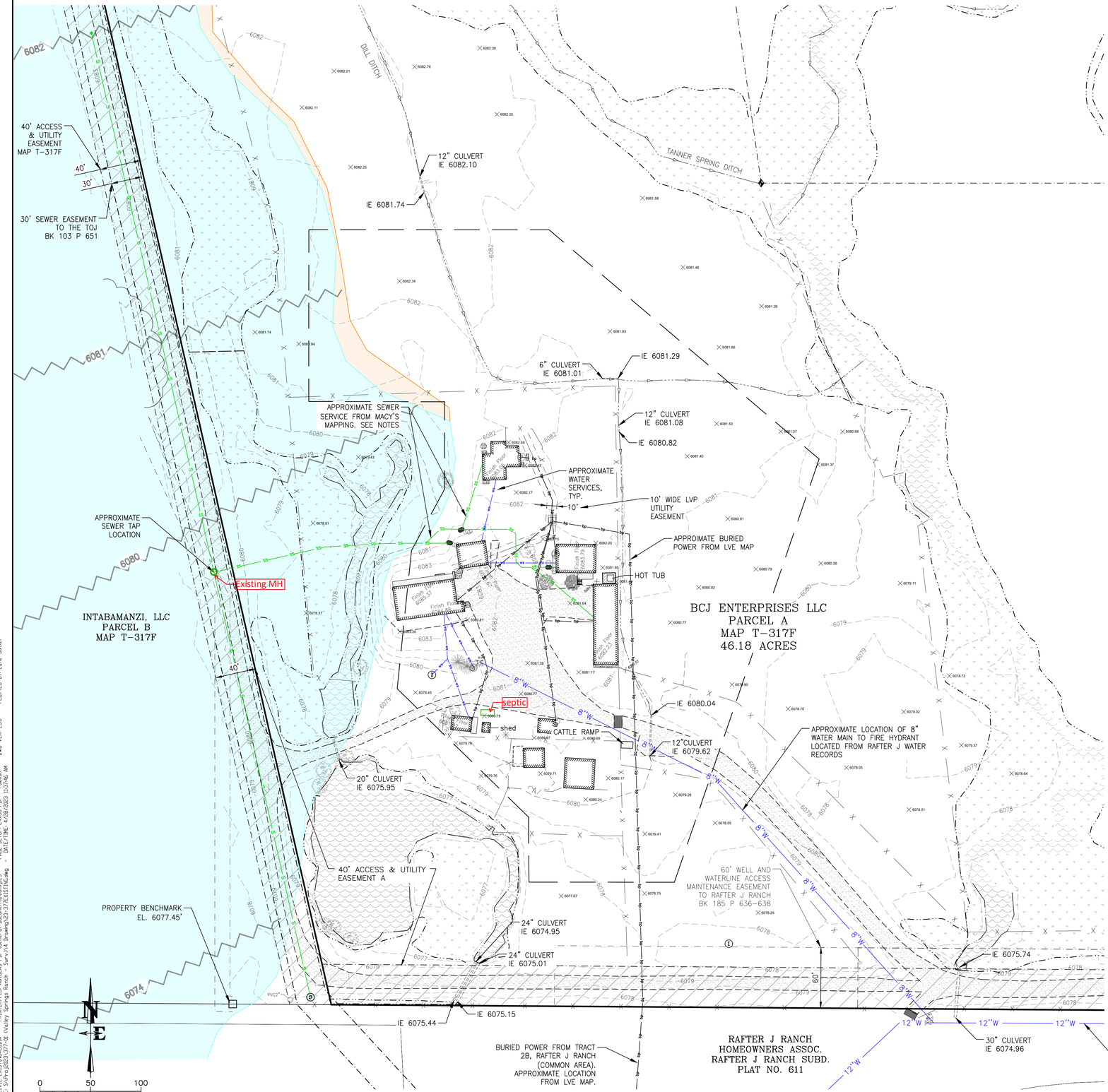
STATE OF WYOMING)
) ss.
COUNTY OF TETON)

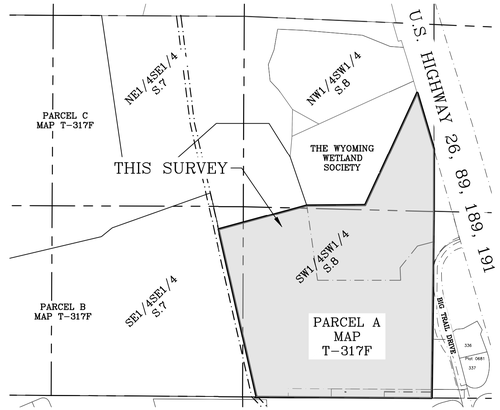
The foregoing instrument was acknowledged before me by Arne O. Jorgensen and Riley Hovorka, as the Mayor and Town Clerk, respectively, of the Town of Jackson this ___ day of _____, 2025.

Witness my hand and official seal.

_____
Notary Public

My commission Expires:





VICINITY MAP
SW1/4 NE1/4
SECTION 6
T40N, R116W 6TH P.M.
TOWN OF JACKSON
TETON COUNTY, WY

NOTE:

THE SITE SURVEY REPRESENTED ON THIS MAP SHOW CONDITIONS DETERMINED BY A FIELD SURVEY MADE ON NOVEMBER 10, 2023. AND MAY NOT REFLECT CHANGES MADE SUBSEQUENT TO THAT DATE.

THE MAP WAS PREPARED WITHOUT BENEFIT OF TITLE REPORT AND IS SUBJECT TO ANY OTHER EASEMENTS, RESTRICTIONS, RESERVATIONS, RIGHTS-OF-WAY, AND CONDITIONS OF SIGHT AND/OR OF RECORD INCLUDING, BUT NOT LIMITED, TO THOSE SHOWN HEREON;

THE PROPERTY LIES WITHIN ZONE AE AND ZONE X OF FIRM PANEL 56039C2908E, DATED SEPT. 16, 2015 AND FIRM PANEL 56039C2916D, DATED AUG. 5, 2010

STRUCTURE SETBACKS PER COUNTY R1 ZONE
50' PUBLIC ROAD
30' PRIVATE ROAD
30' SIDE
30' REAR
50'-150' STREAM, LAKE, POND
15' IRRIGATION DITCH

SITE DEVELOPMENT SETBACKS AND BUILDING SETBACKS SHALL BE VERIFIED WITH THE PLANNING DEPARTMENT IN THE AUTHORITY HAVING JURISDICTION PRIOR TO PLANNING ANY DEVELOPMENT. IT IS ALSO TO BE UNDERSTOOD THAT OTHER APPLICABLE CODES, RESTRICTIONS, COVENANTS AND REGULATIONS APPLICABLE TO DEVELOPMENT AND USE SHOULD BE DETERMINED PRIOR TO PLANNING ANY DEVELOPMENT AS THESE ARE NOT SHOWN ON THIS MAPPING.

NO PUBLIC INFORMATION ON LOCATION OF EXISTING LEACHFIELD WAS LOCATED.

POWER AND WATER UTILITIES HAVE BEEN APPROXIMATED FROM COUNTY RECORD DRAWINGS.

MACY'S PERFORMED A SEWER INVESTIGATION JULY 26, 2024 TO RECORD SEWER ROUTING AND DEPTH FROM THE STRUCTURES ON THE PROPERTY TO THE WESTERN SEWER MAIN TAP. ROUTING HAS BEEN SHOWN ON THIS MAP FROM THE INVESTIGATION RESULTS. THE ROUTING WAS NOT SURVEYED AND IS APPROXIMATE.

LEGEND

- PROPERTY LINE
- ADJACENT BOUNDARY LINE
- EASEMENT LINE
- BUILDING ENVELOPE
- BUILDING
- CENTERLINE OF ROAD
- FLOWLINE OF DITCH
- EDGE OF GRAVEL
- EDGE OF PAVEMENT
- EDGE OF WATER
- FENCE LINE
- TREE LINE
- TOP OF BANK
- VIEW ANGLE
- BASE FLOOD ELEVATION LINE
- CULVERT
- ELECTRIC METER
- ELECTRIC TRANSFORMER
- FIBER OPTIC VAULT
- FIRE HYDRANT
- FOUND BRASS CAPPED PIPE
- FOUND PIPE
- FOUND REBAR AND CAP 3831
- IRRIGATION BOX
- SANITARY SEWER CLEANOUT
- SANITARY SEWER MANHOLE
- SIGN
- SPRINKLER
- TELEPHONE PEDESTAL
- WELL PUMP
- WATER VALVE
- PAVERS
- PAVEMENT
- DECK
- GRAVEL DRIVE
- CONCRETE
- WATER
- TREE - ASPEN
- TREE - DECIDUOUS
- TREE - PINE
- FLOODPLAIN ZONE AE
- FLOODPLAIN ZONE X
- MAPPED WETLANDS

REV.	DATE	NELSON ENG.
	10/24/2024	
	SURVEYED	DD
	ENGINEERED	
	DRAWN	LB
	CHECKED	DD
	APPROVED	DD

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

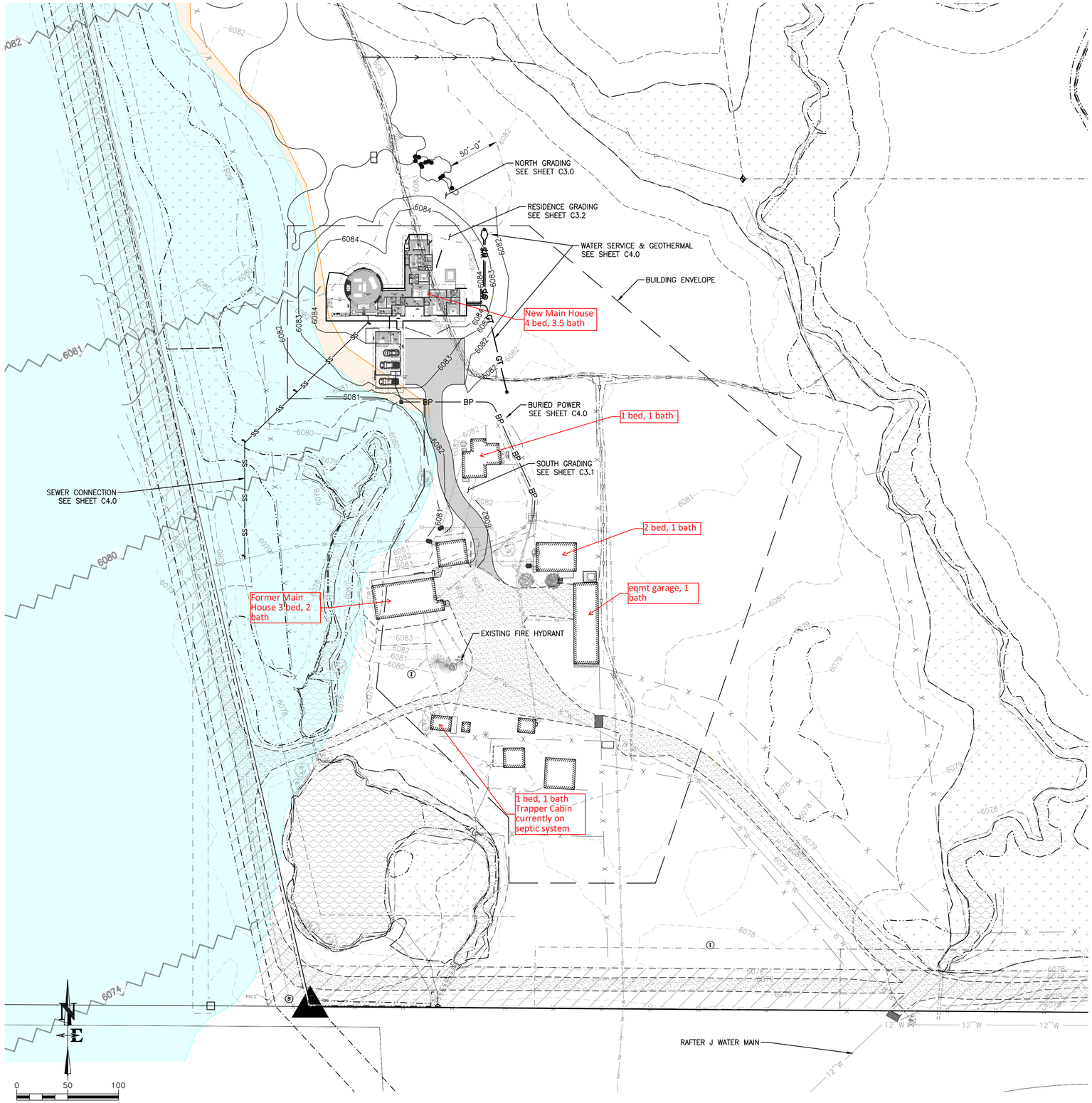
DRAWING TITLE
EXISTING SITE PLAN

JOB TITLE
VALLEY SPRINGS RANCH
1375 VALLEY SPRINGS ROAD
TETON COUNTY, WY

DRAWING NO C1.0

JOB NO 24-060-01

LAYOUT: CIVIL_EXISTINGMAPBIA - PRINTXYCS: AutoCAD PSF (General Documents\tonipc3 - PAGE SETUP: 24x36 PSF - Publish - DWG VER: 2510 - PLOTTED BY: Lane Butler
DWG NAME: C:\Projects\2024\24-060-01 Valley Springs Ranch - Survey\01 Drawing Set\24-060-01TOPO.dwg - DATE/TIME: 4/29/2025 10:04:46 AM



SITE CONSTRUCTION NOTES & SPECIFICATIONS

CAUTION: UNDERGROUND UTILITY LOCATIONS ARE NOT GUARANTEED, NOR IS THERE ANY GUARANTEE THAT ALL EXISTING UTILITIES (WHETHER FUNCTIONAL OR ABANDONED) WITHIN THE PROJECT AREA ARE SHOWN ON THESE CONSTRUCTION DRAWINGS. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL UNDERGROUND UTILITIES BEFORE STARTING WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGE RESULTING FROM CONTRACTORS WORK.

1. ALL SITE WORK SHALL BE DONE IN ACCORDANCE WITH WYOMING PUBLIC WORKS STANDARD SPECIFICATIONS (WPWSS) 2023 EDITION AND THESE PLANS.
2. CONTRACTOR REQUIRED TO MEET WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY'S STORMWATER PERMIT REQUIREMENTS.
3. IT IS RECOMMENDED THAT THE CONTRACTOR EMPLOY A SURVEYOR TO PROVIDE STAKING FOR LOCATIONS OF FOUNDATIONS, UTILITIES, DRIVEWAY, AND FOR GRADING WORK.
4. STRIPPED MATERIAL SHALL BE STOCKPILED AT STOCKPILE AREAS, CUT MATERIAL WILL BE PLACED DIRECTLY INTO FILL AREAS OR STOCKPILED.
5. TOPSOIL SHALL BE STOCKPILED SEPARATELY & REUSED TO COVER FINISH SLOPES. IMPORT ADDITIONAL WEED-FREE TOPSOIL IF NECESSARY TO COVER ALL DISTURBED AREAS NOT RECEIVING SURFACING. LEAVE SUBGRADE DOWN 4-6" TO RECEIVE TOPSOIL IN LANDSCAPE AREAS.
6. DUST CONTROL MUST BE ACCOMPLISHED BY WATERING STOCKPILES AND DRY SOILS.
7. CONTRACTOR SHALL PREVENT TRACKING OF SOIL ONTO THE ROAD AND CLEAN ROAD OF SOILS WHEN NECESSARY.
8. INSTALL EROSION CONTROL MEASURES PRIOR TO COMMENCING WITH LAND DISTURBING ACTIVITIES AND MAINTAIN THE DEVICES DURING CONSTRUCTION. IF NECESSARY THE CONTRACTOR SHOULD INSTALL AND MAINTAIN ADDITIONAL EROSION CONTROL MEASURES TO ENSURE THE SITE IS STABILIZED DURING CONSTRUCTION.
9. REVEGETATION SHALL BE NATIVE SEED AND SOD AND SHALL BE IRRIGATED BY OWNER WHEN NECESSARY.
10. CONTRACTOR MUST HAVE A WEED CONTROL PLAN PREPARED BY TETON COUNTY WEED AND PEST OR OTHER WEED SPECIALIST AND IMPLEMENT THE PLAN THROUGHOUT CONSTRUCTION.
11. LAND DISTURBING ACTIVITIES SHALL OCCUR FROM SPRING 2025 THROUGH FALL 2027.
12. CONTRACTOR SHOULD COORDINATE THE INSTALLATION OF WIRE UTILITY SERVICES WITH UTILITY PROVIDERS AND ARRANGE INSTALLATION AND SERVICE CONTRACTS.
13. A GEOTECHNICAL REPORT WAS PREPARED BY NELSON ENGINEERING, DATED MAY 2024. CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FOR FOUNDATION SOILS PREPARATION, FOUNDATION BACKFILL, DRIVEWAY CONSTRUCTION, AND OTHER SOIL PREPARATION FOR SLABS AND UTILITIES.

TETON COUNTY WEED AND PEST MANAGEMENT STRATEGIES

PRE-CONSTRUCTION MANAGEMENT STRATEGIES TO BE PERFORMED BY CONTRACTOR:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL CONTACT THE TETON COUNTY WEED & PEST, OR OTHER QUALIFIED PROFESSIONAL, TO CONDUCT A SITE SPECIFIC INVENTORY OF INVASIVE SPECIES AND CREATE A SPECIES SPECIFIC MANAGEMENT PLAN IN ACCORDANCE WITH TETON COUNTY LDR 5.7.2.

ACTIVE CONSTRUCTION MANAGEMENT STRATEGIES TO BE PERFORMED BY CONTRACTOR:

1. ALL CONSTRUCTION EQUIPMENT TO BE CLEANED PRIOR TO ENTERING THE SITE.
2. SOIL STOCKPILES TO BE ROUTINELY CHECKED AND TREATED FOR INVASIVE SPECIES.
3. DISTURBANCE OUTSIDE OF THE CONSTRUCTION ZONE AND IN AREAS WHERE INVASIVE SPECIES ARE PRESENT SHALL BE MINIMIZED.
4. ALL AREAS OUTSIDE OF THE CONSTRUCTION ZONE SHALL BE KEPT ON ACTIVE MANAGEMENT USING THE CONTROL METHODS PRESCRIBED IN THE SPECIES SPECIFIC MANAGEMENT PLAN CREATED PRIOR TO CONSTRUCTION. THIS AREA SHALL BE MONITORED AND TREATED AT LEAST TWICE EACH GROWING SEASON.

POST-CONSTRUCTION MANAGEMENT STRATEGIES TO BE PERFORMED BY CONTRACTOR:

1. RE-VEGETATION TO OCCUR IMMEDIATELY AFTER CONSTRUCTION IS COMPLETE TO PREVENT THE ESTABLISHMENT OF INVASIVE SPECIES IN DISTURBED AREAS.
2. NURSERY STOCK SHALL BE IN ACCORDANCE WITH W.S. 11-9-101 – 109 (WYOMING NURSERY STOCK LAW), ACCOMPANIED BY A VALID HEALTH CERTIFICATE, AND ACQUIRED THROUGH A DEALER LICENSED BY THE WYOMING DEPARTMENT OF AGRICULTURE. SEEDS SHALL BE IN ACCORDANCE WITH W.S. 11-12-101 – 125 (WYOMING SEED LAW), CERTIFIED WEED FREE, AND ACQUIRED THROUGH A DEALER LICENSED BY THE WYOMING DEPARTMENT OF AGRICULTURE.
3. CERTIFIED WEED FREE STRAW, GRAVEL, AND SOIL SHALL BE UTILIZED WHERE POSSIBLE.
4. TCWP TO BE CONTACTED TO CREATE A POST-CONSTRUCTION INVENTORY.

2-28-25 50% CHECK SET

DATE	2/28/2025	REV.
SURVEYED	NELSON ENG.	
ENGINEERED	DD	
DRAWN	LB	
CHECKED	DD	
APPROVED	DD	

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

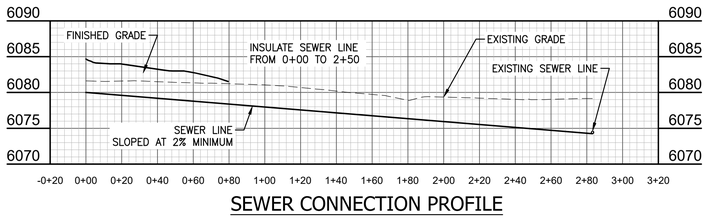
DRAWING TITLE: OVERALL SITE PLAN

JOB TITLE: VALLEY SPRINGS RANCH
1375 VALLEY SPRINGS ROAD
TETON COUNTY, WY

DRAWING NO: C2.0

JOB NO: 24-060-01

LAYOUT: FINAL ▪ 09MAR - PRINTED/PC3 AutoCAD PDF (General Documentation).pc3 - PAGE SETUP 24x36 PDF - Publish - DWG VER 25.0 - PLOTTED BY Lane Butler
DWG NAME: S:\Projects\060-01 Valley Springs Ranch - Civil\4 Drawings\Civil\24-060-01_DRAW.dwg - DATE/TIME 4/28/2025 10:37:16 AM



SEWER CONNECTION PROFILE

PROPOSED DOMESTIC SUPPLY WELL
SINGLE WELL 2 PUMPS

40 GPM DOMESTIC & IRRIGATION SUPPLY
@ 60PSI AT HOUSE

30 GPM GEOTHERMAL SUPPLY
@ 20PSI AT HOUSE

SEE WELL NOTES AND DETAILS 3&4
SHEET C5.0

BUILDING ENVELOPE, TYP

RAISED LEVEL
FF = 101'-0"
= 6086.83'

MAIN LEVEL FF
= 100'-0" =
6085.83'

GARAGE
FF = 98'-0"
= 6083.83'

WATER SERVICE & GEOTHERMAL
2"ø PE DR11 PIPE @ 7' BURY

CLEANOUT
IE=6080±

ELECTRIC METER BASE
AND DISCONNECT

FLOODPLAIN
ZONE X

SEWER SERVICE
SLOPED AT 2% MINIMUM
4"ø SCH40 PVC
RESTORE SURFACE TO
EXISTING CONDITIONS

30'-0"

30'
WETLANDS
SETBACK

MAPPED
WETLANDS

FLOODPLAIN
ZONE AE

30' OF BURIED
SECONDARY
POWER

INSTALL TRANSFORMER,
COORDINATE INSTALLATION
WITH LVE

PROPOSED GEOTHERMAL
INJECTION WELL
UP TO 30 GPM

INSTALL CLEANOUTS
AT BENDS AND
EVERY 100'

EXISTING SPOT
ELEVATIONS, TYP.

IE=6076.50'

PRIMARY POWER

EXISTING
CABIN

EXISTING LVE EASEMENT

COORDINATE WITH LVE TO
FEED NEW PRIMARY
POWER TO NEW
TRANSFORMER LOCATION

EXISTING TRANSFORMER

APPROXIMATE EXISTING
SEWER SERVICE

PROPERTY LINE

EXISTING
GARAGE

EXISTING
CABIN

EXISTING PRIMARY POWER
FROM TRACT 2B, RAFTER J
RANCH (COMMON AREA).
APPROXIMATE LOCATION
FROM LVE MAP.

APPROXIMATE
LOCATION OF
EXISTING SEWER TAP

CONNECT TO EXISTING SEWER LINE
IE=6074.25'±

EXPOSE EXISTING PIPE, CONFIRM
ADEQUATE SLOPE (2% MINIMUM) AND
PIPE CONDITION. REPLACE PIPE IF
NECESSARY FOR ACCEPTABLE SEWER
FLOW. RESTORE SURFACE TO EXISTING
CONDITIONS

EXISTING
CABIN

APPROXIMATE
WATER SERVICE
TO EXISTING
STRUCTURES

0 20 40

2-28-25 50% CHECK SET

REV.	DATE	2/28/2025
	SURVEYED	NELSON ENG.
	ENGINEERED	DD
	DRAWN	LB
	CHECKED	DD
	APPROVED	DD

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE
UTILITY SITE PLAN

JOB TITLE
VALLEY SPRINGS RANCH
1375 VALLEY SPRINGS ROAD
TETON COUNTY, WY

DRAWING NO
C4.0

JOB NO
24-080-01

LAYOUT: UTIL 28x+11218 -- PRINTED/PC3: AutoCAD PDF (General Documentation).pc3 -- PAGE SETUP: 24x36 PDF -- PUBLISH -- DWG VER: 2510 -- PLOTTED BY: Lane Butler
DWG NAME: S:\Projects\080-01 (Valley Springs Ranch - Civil)\Drawings\Civil\24-080-01_UTIL.dwg -- DATE/TIME: 4/28/2025 10:10:46 AM

Affordable Rental Deed Restriction for Property
Located at _____
The Loop Apartments (West Building)

This Deed Restriction ("Restriction") is made and entered into this ___ day of _____, 20__, by the undersigned owner of the property ("Declarant") and the Town of Jackson, Wyoming.

RECITALS:

WHEREAS, Declarant holds fee ownership interest in that certain real property, located in Town of Jackson, Wyoming, and more specifically described as follows:

See **Exhibit "A"** attached hereto and incorporated herein by reference

PIDN: _____("Land")

WHEREAS, Declarant developed the Land with two residential apartment buildings, which generated the obligation to provide housing, and said obligation being set as a condition of approval for Permit No. B23-0291 and B23-0292, and to place an Affordable Program restriction on said housing in accordance with the Jackson/Teton County Housing Department Rules and Regulations (defined below). Declarant is restricting:

- Unit W153, with two bedrooms with Income Range 80-120% Median Family Income.

(the "Residential Unit").

The Income Ranges are defined in the Rules and Regulations.

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners resolved to form the Jackson/Teton County Housing Authority, a duly constituted housing authority pursuant to Wyo. Stat. §15-10-116, as amended, and its successors or assigns, known as the Jackson/Teton County Housing Authority ("JTCHA");

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners further resolved to create the Jackson/Teton County Affordable Housing Department ("Housing Department") who are employees of Teton County and agents acting on behalf of the JTCHA, empowered to enforce this Restriction;

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners have duly enacted the Jackson/Teton County Housing Department Rules and Regulations (defined below) and this Restriction is subject to such Rules and Regulations as they are amended from time to time;

WHEREAS, in furtherance of the goals, objectives, requirements, and conditions of Permit No. B23-0291 and B23-0292, and consistent with the Town of Jackson's goal of providing decent, safe, and sanitary housing to qualified employees working in Teton County, Wyoming, that is affordable, Declarant agrees to restrict the use and occupancy of the Residential Unit as set forth herein;

WHEREAS, Declarant desires to record this Restriction and declare that the Residential Unit shall be held, sold, and conveyed in perpetuity subject to this Restriction and the Rules and Regulations, as they may be amended from time to time, which Restriction shall be in addition to all other covenants, conditions, or restrictions of record affecting the Residential Unit, and shall be enforceable by JTCHA and Town of Jackson, Wyoming. Furthermore, Declarant hereby declares that where the term "Declarant" is used in this Restriction it includes and means each and every subsequent owner, unless otherwise specifically clarified.

NOW, THEREFORE, in satisfaction of the conditions in and consideration of Permit No. B23-0291 and B23-0292, Declarant hereby declares, covenants, and agrees for itself and each and every person acquiring ownership of the Land and/or Residential Unit, that they shall be held, used, occupied, developed, transferred, and conveyed subject to this Restriction in perpetuity.

ARTICLE I
RENTAL BY QUALIFIED HOUSEHOLD

1.1 Qualified Household. The rental of the Residential Unit shall be limited to natural persons who meet the definition of a Qualified Household, as set forth herein and as further defined in the Rules and Regulations ("Qualified Household").

1.1.1 Employment. At time of rental and in perpetuity during any and all rental periods, at least one member of the Qualified Household must work a minimum of 1,560 hours per year for a Local Business, as that term is defined in the Rules and Regulations.

1.1.2 Income Limit. At time of rental and in perpetuity during any and all rental periods, the Qualified Household's gross income must be between 80-120% of the median family income in Teton County, Wyoming, as established in the applicable year's United States Department of Housing and Urban Development's median family income chart for Teton County, Wyoming.

1.1.3 Residential Real Estate. At time of rental and in perpetuity during any and all rental periods, no member of the Qualified Household may own (whether individually, in trust, or through an entity including without limitation a partnership, limited partnership, limited liability company, corporation, association, or the like) real estate except as set forth in the Rules and Regulations.

1.2 Qualification Determination by the Housing Department. The Housing Department shall determine, in its sole discretion, whether a prospective renter is a Qualified Household. The Department shall use written applications, representations, and information to make the determination, which shall include the verification of those materials as necessary and appropriate to establish and substantiate eligibility.

.

ARTICLE II
OCCUPANCY, IMPROVEMENT, AND USE

2.1 Rules and Regulations Applicability. Unless otherwise explicitly provided herein, all applicable limitations on occupancy, improvement, and use set forth in the Rules and Regulations, apply to the Residential Unit.

2.2 Business Activity. No business activities shall be carried out in a Residential Unit, except to the extent allowed in the Rules and Regulations.

2.3 Guests. No persons other than those comprising the Qualified Household, as set forth in the Rules and Regulations, may occupy the Residential Unit.

2.4 Maintenance. Declarant shall be responsible for the cost and expense to keep and maintain the interior of the Residential Unit, and all other aspects of the Residential Unit not otherwise maintained by a homeowner's association in a safe, decent, and sanitary condition pursuant to the Rules and Regulations. In the event Declarant fails to maintain the Residential Unit in a safe, decent, and sanitary condition, the Housing Department may take action, and be reimbursed for costs thereof, all as set forth in the Rules and Regulations.

2.5 Insurance. Declarant shall keep the Residential Unit continuously insured as set forth in the Rules and Regulations. Declarant shall, as often as necessary to prove compliance herewith at all times, furnish and deposit with the Housing Department certificates of such insurance policy to be maintained by Declarant with evidence of payment of the premiums thereon.

2.6 Compliance with Laws and CC&Rs. The Residential Unit shall be occupied in full compliance with this Restriction; the Rules and Regulations; all laws, statutes, codes, rules, regulations of state, local, and federal law; Covenants, Conditions & Restrictions; and all supplements and amendments thereto.

2.7 Inspection. Upon reasonable notice to Declarant, the Housing Department shall have the right to inspect the Residential Unit from time to time as set forth in the Rules and Regulations.

2.8 Records. Declarant shall maintain records of service, rental, repair, and maintenance for a period of 2 years after their issuance. The Housing Department shall have the right to review the written records required to be maintained by Declarant.

2.9 Renting. The Residential Unit may be rented to the extent allowed in the Rules and Regulations. In addition to that set forth in the Rules and Regulations, the Residential Unit may be rented for a minimum period of 180 days.

2.10 Periodic Reporting. In order to confirm compliance with this Restriction, the Rules and Regulations, and other covenants, regulations, ordinances, or rules governing the ownership, occupancy, use, improvement, or transfer of the Residential Unit, Declarant shall timely comply with information requests, application material submission, and all supplemental requests as set forth in the Rules and Regulations. If the Declarant rents the Unit, the Declarant is responsible for timely compliance with all reporting requirements.

2.11 Occupancy. The Residential Unit must be occupied as the Qualified Household's sole and exclusive primary residence, and they must physically reside therein on a full-time basis pursuant to the Rules and Regulations.

2.12 No Owner Occupancy. Declarant shall not reside in or occupy the Residential Unit. For purposes of this paragraph, if Declarant is an entity (including without limitation, a partnership, limited partnership, Limited Liability Company, corporation, association, or other) or a trust, this prohibition on owner-occupancy extends to any partner, member, shareholder, other principal or owner of the entity, and any trustee or beneficiary of the trust.

ARTICLE III
SALE

3.1 Sale of The Residential Unit. The Residential Unit may be bought and sold, except that all reporting and record-keeping required herein shall be continuous and any new owner shall obtain the required records from the prior owner. Every conveyance of the Residential Unit shall be subject to this Restriction. Within 10 days prior to the closing of the sale or other transfer of the Residential Unit, seller shall notify the Housing Department of the pending sale or transfer and, prior to closing, provide the Housing Department with contact information (including without limitation, mailing address, phone number and email) for the purchaser.

ARTICLE IV
TERMINATION, AMENDMENT, CORRECTION

4.1 Termination by the Town of Jackson, Wyoming. This Restriction may be terminated after a determination by the Town of Jackson, Wyoming that this Restriction is no longer consistent with the goal of providing affordable housing.

4.2 Amendment. This Restriction may be amended by a signed, written amendment executed by both the Town of Jackson, Wyoming and Declarant and recorded in the Teton County Clerk's Office against title to the Residential Unit.

4.3 Correction. JTCHA may unilaterally correct this Restriction to address scrivener's errors, erroneous legal descriptions, or typographical errors.

ARTICLE V
GENERAL PROVISIONS

5.1 Breach.

5.1.1 Breach Defined. Each of the following shall be considered a breach hereof ("Breach").

5.1.1.1 A violation of this Restriction, the Rules and Regulations, the Declaration of Covenants, Conditions & Restrictions, or any rule or law a violation of which could result in a lien recorded against a Residential Unit.

5.1.1.2 Failure to pay any financial obligation due or failure to perform a non-monetary obligation with respect to the Residential Unit which failure to pay or perform could result in a lien recorded against a Residential Unit. This includes, without limitation, homeowner dues, property taxes, contractor and servicer bills, and payment required by a promissory note secured by a mortgage recorded against a Residential Unit. Declarant shall notify the Housing Department in writing of any notification received from any party of past due payments or failure to perform within ten (10) calendar days of the date on the first notice of any such failure to pay or perform.

5.1.1.3 The Residential Unit is taken by execution or by other process of law, or Declarant is judicially declared insolvent, or Declarant assigns or attempts to assign the property for the benefit of creditors, a receiver, trustee, or other similar officer being appointed to take charge of any substantial part of the Residential Unit or Declarant's property by a court of competent jurisdiction.

5.1.1.4 Fraud or material misrepresentation by Declarant or an occupant (with Declarant's knowledge) in the provision of information or documents included in an application, or additional submissions of requested documentation by the Housing Department, and related to the mission, goals, objectives, requirements, and conditions of JTCHA and its programs.

5.1.2 Administrative Process. Upon any alleged Breach, the parties must proceed in accordance with the default process set forth in the Rules and Regulations, as they may be amended from time to time.

5.1.3 Court Enforcement. After exhausting the administrative process required by Article 5.1.2 any order of the Housing Authority Board may be appealed via a court of competent jurisdiction.

5.1.4 Breach Remedies. If the Residential Unit is or becomes legally recognized as an independent lot of record after the execution of this Restriction, concurrent with the recordation of a plat condominiumizing the Residential Unit, this Section (Breach Remedies) shall be amended to incorporate additional breach remedies consistent with the Rules and Regulations in place at the time of condominiumization.

JTCHA may, at its discretion, invoke any remedies available to it and seek any such relief, at law or equity, as may be appropriate, including but not limited to, specific performance of this Restriction and the Rules and Regulations; temporary, permanent, or preliminary injunctive relief (including prohibiting a proposed sale or transfer); a declaration that a sale or transfer is void; and monetary damages. Any equitable relief may be sought singly or in combination with such other remedies the JTCHA may be entitled to, either pursuant to this Restriction, the Rules and Regulations, the applicable Land Development Regulations, or under the local, state, or federal law.

5.1.5 Hold Harmless. In the event of a Breach, Declarant hereby holds the Town of Jackson , Wyoming, JTCHA, and the Housing Department, their officials, employees, and agents harmless against any and all claims, suits, or actions of every name, kind, and description and any other loss or cost, including but not limited to that caused by the concurrent active or passive negligence of the Town of Jackson, Wyoming, JTCHA, and the Housing Department, their officials, employees, and agents.

5.1.6 Reimbursement. In the event of a Breach, Declarant hereby agrees to reimburse the actual expenses, attorney's fees, and costs for any action the JTCHA and/or Housing Department expends to enforce this Restriction.

5.2 Jackson/Teton County Housing Department Housing Rules and Regulations. The term "Rules and Regulations" is defined as the Jackson/Teton County Housing Department Rules and Regulations, as the same may be amended from time to time and which are codified in the Municipal Code of the Town of Jackson, and enacted by resolution of Teton County, Wyoming pursuant to the Wyoming Administration Procedures Act. If there are no such written policies, procedures, or guidelines (or a written policy, procedure, or guideline with respect to a specific matter) then the reference shall be to the current applied policy or policies of the Housing Department or its successor. Procedural and administrative matters not otherwise addressed in this Restriction shall be as set forth in the Rules and Regulations, as the same may be amended from time to time. In the case of a conflict between this Restriction and the Rules and Regulations, this Restriction shall apply.

5.3 No Legal Action. Neither the Declarant, nor any prospective purchaser, tenant, renter, occupant, or other party shall have the right to sue or bring other legal process against the Town of Jackson, Wyoming or the Housing Department, or any person affiliated with the Town of Jackson, Teton County, Wyoming, or the Housing Department arising out of this Restriction. Neither the Town of Jackson, Teton County, Wyoming, nor the Housing Department shall have any liability to any person aggrieved by the decision of the Town of Jackson, Teton County, Wyoming, or the Housing Department regarding eligibility of a Qualified Household or any other matter relating to this Restriction.

5.4 Restriction as a Covenant. This Restriction shall constitute covenants running with the Land and the Residential Unit, as a burden thereon, and shall be binding on all parties having any right, title, or interest in the Land, the Residential Unit, or any part thereof, their heirs, devisees, successors and assigns, and shall inure to the benefit of and shall be enforceable by JTCHA, the Housing Department, and the Town of Jackson, Wyoming.

5.5 Notices. All notices required to be served upon Declarant and the Town of Jackson, Wyoming and shall be transmitted by one of the following methods: prepaid overnight courier; or by postage paid certified mail, return receipt requested, at the address set forth below for said party. Notice shall be effective 1 day after being deposited with an overnight courier, or 5 business days after being placed in the mail.

To JTCHA / Housing Department:
Jackson/Teton County Affordable Housing Department
P.O. Box 714
Jackson, WY 83001

With a Copy to:
Town of Jackson, Wyoming.
Attn: Clerk
P.O. Box 1687
Jackson, WY 83001.

Declarant
To the Address on file with the Teton County Clerk's Office

5.6 Attorney's Fees. In the event any party shall be required to retain counsel and file suit for the purpose of enforcing the terms and conditions of this Restriction, the prevailing party shall be entitled to recover, in addition to any other relief recovered, a reasonable sum as determined by the court for attorney's fees and costs of litigation.

5.7 Incorporation of Recitals. All of the recitals hereof are incorporated by this reference and are made a part hereof as though set forth at length herein.

5.8 Choice of Law, Forum. This Restriction and each and every related document, are to be governed by and construed in accordance with the laws of the State of Wyoming. The parties agree that the appropriate court in Teton County, Wyoming and/or the Ninth Judicial District for the State of Wyoming shall have sole and exclusive jurisdiction over any dispute, claim, or controversy which may arise involving this Restriction or its subject matter. Declarant by accepting a deed for the Residential Unit hereby submits to the personal jurisdiction of any such court in any action or proceeding arising out of or relating to this Restriction.

5.9 Severability. Each provision of this Restriction and any other related document shall be interpreted in such a manner as to be valid under applicable law; but, if any provision, or any portion thereof, of any of the foregoing shall be invalid or prohibited under said applicable law, such provision shall be deemed modified to the extent necessary and possible to render it valid and enforceable, or if such modification

is not possible, such provision shall be ineffective to the extent of such invalidity or prohibition without invalidating the remaining provision(s) of such document.

5.10 Section Headings. Paragraph or section headings within this Restriction are inserted solely for convenience or reference, and are not intended to, and shall not govern, limit or aid in the construction of any terms or provisions contained herein.

5.11 Waiver. No claim of waiver, consent or acquiescence with respect to any provision of this Restriction shall be valid against any party hereto except on the basis of a written instrument executed by the parties to this Restriction. However, the party for whose benefit a condition is inserted herein shall have the unilateral right to waive such condition.

5.12 Indemnification. Declarant shall indemnify, defend, and hold JTCHA, the Housing Department, and the Town of Jackson, Wyoming, and each entity's directors, officers, agents and employees harmless against any and all loss, liability, claim, or cost (including reasonable attorneys' fees and expenses) for damage or injury to persons or property from any cause whatsoever on or about the Residential Unit, or for Declarant's breach of any provision of this Restriction. Declarant waives any and all such claims against JTCHA, the Housing Department and the Town of Jackson, Wyoming.

5.13 Successors and Assigns. This Restriction shall be binding upon, and inure to the benefit of, the parties hereto and their respective successors, heirs, devisees, administrators, and assigns.

5.14 Governmental Immunity. Neither the Town of Jackson, Wyoming nor the JTCHA or Housing Department waives governmental immunity by executing this Restriction and each specifically retain immunity and all defenses available to either of them as government pursuant to Wyo. Stat. Ann. § 1-39-104(a) and any other applicable law.

IN WITNESS WHEREOF, this Restriction shall be effective as of the date it is recorded in the Office of the Teton County, Wyoming Clerk (the "Effective Date").

Declarant: MOGUL HOSPITALITY PARTNERS - THE LOOP, LLC, a Delaware limited liability company

_____

By:
Its:

STATE OF WYOMING)
) ss.
COUNTY OF TETON)

On the _____ day of _____ 20____, the foregoing Restriction was acknowledged before me by _____ as _____ of MOGUL HOSPITALITY PARTNERS - THE LOOP, LLC, a Delaware limited liability company.

Witness my hand and official seal.

(Seal)

Notary Public

Town of Jackson

_____

Arne O. Jorgensen, Mayor

ATTEST:

_____

Riley Hovorka, Town Clerk

Exhibit A
Legal Description of Combined Tract

A parcel of land located within the Government Lots 1 and 2 of Section 6, T. 40 N., R. 116 W., 6th P.M., Teton County, Wyoming, being more particularly described by the following metes and bounds:

BEGINNING at a point on the south right-of-way line of South Park County Road No. 22-1, being coincident with the northeast corner of Parcel 2 as shown on Map T-311F recorded in the Office of the Clerk of Teton County, Wyoming, and marked by a 2.5-inch diameter aluminum cap inscribed "PLS 3831";

THENCE N 81°49'54" E, 281.15 feet, along said right-of-way line to a point marked by a 1-inch diameter iron pipe;

THENCE N 64°57'07" E, 134.01 feet, continuing along said right-of-way line to a point marked by steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE N 64°53'52" E, 81.58 feet, continuing along said right-of-way line to a point marked by a 1-inch diameter iron pipe;

THENCE N 50°29'02" E, 20.37 feet, continuing along said right-of-way line to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 26°55'20" E, 3.41 feet, departing said right-of-way line and along the line common to those tracts labeled "42P93 & 94" as shown on Map T-311D recorded in said Office, to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 26°55'20" E, 145.93 feet, continuing along said common line to a point marked by a 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 57°06'43" W, 89.24 feet, along the south line of the westerly tract labeled "42P93 & 94" as shown on Map T-311D, to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 57°23'05" W, 50.22 feet, along the south line of that tract labeled "105P749-751" to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 66°01'26" W, 68.79 feet, continuing along said south line to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 74°18'24" W, 78.52 feet, continuing along said south line to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 74°29'23" W, 21.50 feet, along the south line of that tract labeled "Edward J. & Margaret E Feuz" as shown on Map T-312A recorded in said Office, to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 71°16'36" W, 166.93 feet, continuing along said south to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 71°38'31" W, 92.38 feet, continuing along said south to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed “PLS 16012” set this survey;

THENCE N 9°45'35" W, 187.99 feet, along the line common to said tract labeled “Edward J. & Margaret E Feuz” and Parcels 3 and 2 as shown on said Map T-311F, to a point marked by a 1-inch diameter iron pipe

THENCE N 9°45'35" W, 9.42 feet, continuing along said common line to a point marked by a 2.5-inch diameter aluminum cap inscribed “PLS 3831”;

THENCE N 9°45'35" W, 7.59 feet, continuing along said common line to the **POINT OF BEGINNING**.

Said parcel encompasses 2.09 acres, more or less.

The basis of bearings for this description is S 9°45'35" E along the line common to that tract labeled “Edward J. & Margaret E Feuz” as shown on Map T-312A and Parcels 3 and 2 as shown on said Map T-311F, recorded in said Office.

All in accordance with that Map of Survey Boundary Line Adjustment prepared for Mogul Hospitality Partners – The Loop, LLC.

Complete Amended and Restated Workforce Rental Deed Restriction for Property
Located at _____
The Loop Apartments (East and West Buildings)

This Deed Restriction ("Restriction") is made and entered into this ___ day of _____, 20__, by the undersigned owner of the property ("Declarant") and Town of Jackson, Wyoming.

RECITALS:

WHEREAS, Declarant holds fee ownership interest in that certain real property, located in Town of Jackson, Wyoming, and more specifically described as follows:

See **Exhibit "A"** attached hereto and incorporated herein by reference

PIDN: _____("Land")

WHEREAS, Declarant participated in the Workforce Housing Floor Area Bonus tool pursuant to which in exchange for restricting the Land and the Residential Unit defined herein with a Workforce Program Restriction in accordance with the Jackson/Teton County Housing Department Rules and Regulations (defined below), Declarant received Additional development potential (Floor Area), all as more specifically set forth in the Rules and Regulations. Being a condition of approval for Permit No. B23-0292 and B23-0291, in which Declarant received additional Floor Area, Declarant is restricting:

- See **Exhibit "B"**

WHEREAS, Declarant participated in the Workforce Housing Incentive for Additional Height tool (or a like successor) pursuant to which in exchange for restricting the Land and the Residential Unit defined herein with a Workforce Program Restriction in accordance with the Jackson/Teton County Housing Department Rules and Regulations (as defined below), Declarant received Additional development potential (Floor Area), all as more specifically set forth in the Rules and Regulations. Being a condition of approval for Permit No. B23-0292 and B23-0291, in which Declarant received additional Floor Area, Declarant is restricting:

- See **Exhibit "C"**

The units described in **Exhibit "B"** and **Exhibit "C"** shall be referred to herein, together or individually, as a "Residential Unit").

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners resolved to form the Jackson/Teton County Housing Authority, a duly constituted housing authority pursuant to Wyo. Stat. §15-10-116, as amended, and its successors or assigns, known as the Jackson/Teton County Housing Authority ("JTCHA");

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners further resolved to create the Jackson/Teton County Affordable Housing Department ("Housing Department") who are employees of Teton County and agents acting on behalf of the JTCHA, empowered to enforce this Restriction;

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners have duly enacted the Jackson/Teton County Housing Department Rules and Regulations (as defined below) and this Restriction is subject to such Rules and Regulations as they are amended from time to time;

WHEREAS, consistent with the foregoing, some of the Residential Units are subject to that certain Workforce Rental Deed Restriction for Property Located at _____ in Jackson, Wyoming, The Loop Apartments (West Building) recorded in the Office of the Teton County, Wyoming Clerk on _____, 2025 as Document Number _____ (the "West Building Restriction");

WHEREAS, in accordance with Section 4.2 of the West Building Restriction, the West Building Restriction may be amended with the written consent of the Town of Jackson, Wyoming and Declarant;

WHEREAS, in accordance with such Section 4.2 of the West Building Restriction, and consistent with the foregoing Recitals, the Town of Jackson, Wyoming and the undersigned Declarant now desire to amend, restate and replace in its entirety, the West Building Restriction by adopting this Complete Amended and Restated Workforce Rental Deed Restriction for Property Located at _____in Jackson, Wyoming, The Loop Apartments (East and West Buildings) ("Restriction") for the Residential Units;

WHEREAS, in furtherance of the goals, objectives, requirements, and conditions of Permit No. B23-0292 and B23-0291, and consistent with the Town of Jackson's goal of providing decent, safe, and sanitary housing to qualified employees working in Teton County, Wyoming, that is affordable, Declarant agrees to restrict the use and occupancy of the Residential Unit as set forth herein;

WHEREAS, Declarant desires to record this Restriction and declare that the Residential Unit shall be held, sold, and conveyed in perpetuity subject to this Restriction and the Rules and Regulations, as they may be amended from time to time, which Restriction shall be in addition to all other covenants, conditions, or restrictions of record affecting the Residential Unit, and shall be enforceable by JTCHA and Town of Jackson, Wyoming. Furthermore, Declarant hereby declares that where the term "Declarant" is used in this Restriction it includes and means each and every subsequent owner, unless otherwise specifically clarified.

NOW, THEREFORE, in satisfaction of the conditions in and consideration of Permit No. B23-0292 and B23-0291, Declarant hereby declares, covenants, and agrees for itself and each and every person acquiring ownership of the Land and/or Residential Unit, that they shall be held, used, occupied, developed, transferred, and conveyed subject to this Restriction in perpetuity.

ARTICLE I
RENTAL BY QUALIFIED HOUSEHOLD

1.1 Qualified Household. The rental of the Residential Unit shall be limited to natural persons who meet the definition of a Qualified Household, as set forth herein and as further defined in the Rules and Regulations ("Qualified Household").

1.1.1 Employment. At time of rental and in perpetuity during any and all rental periods, at least one member of the Qualified Household must work a minimum of 1,560 hours per year for a Local Business, as that term is defined in the Rules and Regulations.

1.1.2 Income Limit. At time of rental and in perpetuity during any and all rental periods, the Qualified Household must earn, at minimum, 75% of its income from a Local Business, as that term is defined in the Rules and Regulations. There is no maximum income or asset limit for Qualified Households.

1.1.3 Residential Real Estate. At time of rental and in perpetuity during any and all rental periods, no member of the Qualified Household may own (whether individually, in trust, or through an entity including without limitation a partnership, limited partnership, limited liability company, corporation, association, or the like) real estate except as set forth in the Rules and Regulations.

1.2 Qualification Determination by the Housing Department. The Housing Department shall determine, in its sole discretion, whether a prospective renter is a Qualified Household. The Department shall use written applications, representations, and information to make the determination, which shall include the verification of those materials as necessary and appropriate to establish and substantiate eligibility.

ARTICLE II
OCCUPANCY, IMPROVEMENT, AND USE

2.1 Rules and Regulations Applicability. Unless otherwise explicitly provided herein, all applicable limitations on occupancy, improvement, and use set forth in the Rules and Regulations, apply to the Residential Unit.

2.2 Business Activity. No business activities shall be carried out in a Residential Unit, except to the extent allowed in the Rules and Regulations.

2.3 Guests. No persons other than those comprising the Qualified Household, as set forth in the Rules and Regulations, may occupy the Residential Unit.

2.4 Maintenance. Declarant shall be responsible for the cost and expense to keep and maintain the interior of the Residential Unit, and all other aspects of the Residential Unit not otherwise maintained by a homeowner's association in a safe, decent, and sanitary condition pursuant to the Rules and Regulations. In the event Declarant fails to maintain the Residential Unit in a safe, decent, and sanitary condition, the Housing Department may take action, and be reimbursed for costs thereof, all as set forth in the Rules and Regulations.

2.5 Insurance. Declarant shall keep the Residential Unit continuously insured as set forth in the Rules and Regulations. Declarant shall, as often as necessary to prove compliance herewith at all times, furnish

and deposit with the Housing Department certificates of such insurance policy to be maintained by Declarant with evidence of payment of the premiums thereon.

2.6 Compliance with Laws and CC&Rs. The Residential Unit shall be occupied in full compliance with this Restriction; the Rules and Regulations; all laws, statutes, codes, rules, regulations of state, local, and federal law; Covenants, Conditions & Restrictions; and all supplements and amendments thereto.

2.7 Inspection. Upon reasonable notice to Declarant, the Housing Department shall have the right to inspect the Residential Unit from time to time as set forth in the Rules and Regulations.

2.8 Records. Declarant shall maintain records of service, rental, repair, and maintenance for a period of 2 years after their issuance. The Housing Department shall have the right to review the written records required to be maintained by Declarant.

2.9 Renting. The Residential Unit may be rented to the extent allowed in the Rules and Regulations. In addition to that set forth in the Rules and Regulations, the Residential Unit must be rented for a minimum period of 180 days. Declarant shall set the rental rate. There is no cap on rent or rent appreciation.

2.10 Periodic Reporting. In order to confirm compliance with this Restriction, the Rules and Regulations, and other covenants, regulations, ordinances, or rules governing the ownership, occupancy, use, improvement, or transfer of the Residential Unit, Declarant shall timely comply with information requests, application material submission, and all supplemental requests as set forth in the Rules and Regulations. If the Declarant rents the Unit, the Declarant is responsible for timely compliance with all reporting requirements.

2.11 Occupancy. The Residential Unit must be occupied as the Qualified Household's sole and exclusive primary residence, and they must physically reside therein on a full-time basis pursuant to the Rules and Regulations.

2.12 No Owner Occupancy. Declarant shall not reside in or occupy the Residential Unit. For purposes of this paragraph, if Declarant is an entity (including without limitation, a partnership, limited partnership, Limited Liability Company, corporation, association, or other) or a trust, this prohibition on owner-occupancy extends to any partner, member, shareholder, other principal or owner of the entity, and any trustee or beneficiary of the trust.

ARTICLE III
SALE

3.1 Sale of The Residential Unit. The Residential Unit may be bought and sold, except that all reporting and record-keeping required herein shall be continuous and any new owner shall obtain the required records from the prior owner. Every conveyance of the Residential Unit shall be subject to this Restriction. Within 10 days prior to the closing of the sale or other transfer of the Residential Unit, seller shall notify the Housing Department of the pending sale or transfer and, prior to closing, provide the Housing Department with contact information (including without limitation, mailing address, phone number and email) for the purchaser.

ARTICLE IV
TERMINATION, AMENDMENT, CORRECTION

4.1 Termination by the Town of Jackson, Wyoming. This Restriction may be terminated after a determination by the Town of Jackson, Wyoming that this Restriction is no longer consistent with the goal of providing affordable housing.

4.2 Amendment. This Restriction may be amended by a signed, written amendment executed by both the Town of Jackson, Wyoming and Declarant and recorded in the Teton County Clerk's Office against title to the Residential Unit.

4.3 Correction. JTCHA may unilaterally correct this Restriction to address scrivener's errors, erroneous legal descriptions, or typographical errors.

ARTICLE V
GENERAL PROVISIONS

5.1 Breach.

5.1.1 Breach Defined. Each of the following shall be considered a breach hereof ("Breach").

5.1.1.1 A violation of this Restriction, the Rules and Regulations, the Declaration of Covenants, Conditions & Restrictions, or any rule or law a violation of which could result in a lien recorded against a Residential Unit.

5.1.1.2 Failure to pay any financial obligation due or failure to perform a non-monetary obligation with respect to the Residential Unit which failure to pay or perform could result in a lien recorded against a Residential Unit. This includes, without limitation, homeowner dues, property taxes, contractor and servicer bills, and payment required by a promissory note secured by a mortgage recorded against a Residential Unit. Declarant shall notify the Housing Department in writing of any notification received from any party of past due payments or failure to perform within ten (10) calendar days of the date on the first notice of any such failure to pay or perform.

5.1.1.3 The Residential Unit is taken by execution or by other process of law, or Declarant is judicially declared insolvent, or Declarant assigns or attempts to assign the property for the benefit of creditors, a receiver, trustee, or other similar officer being appointed to take charge of any substantial part of the Residential Unit or Declarant's property by a court of competent jurisdiction.

5.1.1.4 Fraud or material misrepresentation by Declarant or an occupant (with Declarant's knowledge) in the provision of information or documents included in an application, or additional submissions of requested documentation by the Housing Department, and related to the mission, goals, objectives, requirements, and conditions of JTCHA and its programs.

5.1.2 Administrative Process. Upon any alleged Breach, the parties must proceed in accordance with the default process set forth in the Rules and Regulations, as they may be amended from time to time.

5.1.3 Court Enforcement. After exhausting the administrative process required by Article 5.1.2 any order of the Housing Authority Board may be appealed via a court of competent jurisdiction.

5.1.4 Breach Remedies. If the Residential Unit is or becomes legally recognized as an independent lot of record after the execution of this Restriction, concurrent with the recordation of a plat condominiumizing the Residential Unit, this Section (Breach Remedies) shall be amended to incorporate additional breach remedies consistent with the Rules and Regulations in place at the time of condominiumization.

JTCHA may, at its discretion, invoke any remedies available to it and seek any such relief, at law or equity, as may be appropriate, including but not limited to, specific performance of this Restriction and the Rules and Regulations; temporary, permanent, or preliminary injunctive relief (including prohibiting a proposed sale or transfer); a declaration that a sale or transfer is void; and monetary damages. Any equitable relief may be sought singly or in combination with such other remedies the JTCHA may be entitled to, either pursuant to this Restriction, the Rules and Regulations, the applicable Land Development Regulations, or under the local, state, or federal law.

5.1.5 Hold Harmless. In the event of a Breach, Declarant hereby holds the Town of Jackson, Wyoming, JTCHA, and the Housing Department, their officials, employees, and agents harmless against any and all claims, suits, or actions of every name, kind, and description and any other loss or cost, including but not limited to that caused by the concurrent active or passive negligence of the Town of Jackson or Teton County, Wyoming, JTCHA, and the Housing Department, their officials, employees, and agents.

5.1.6 Reimbursement. In the event of a Breach, Declarant hereby agrees to reimburse the actual expenses, attorney's fees, and costs for any action the JTCHA and/or Housing Department expends to enforce this Restriction.

5.2 Jackson/Teton County Housing Department Housing Rules and Regulations. The term "Rules and Regulations" is defined as the Jackson/Teton County Housing Department Rules and Regulations, as the same may be amended from time to time and which are codified in the Municipal Code of the Town of Jackson, and enacted by resolution of Teton County, Wyoming pursuant to the Wyoming Administration Procedures Act. If there are no such written policies, procedures, or guidelines (or a written policy, procedure, or guideline with respect to a specific matter) then the reference shall be to the current applied policy or policies of the Housing Department or its successor. Procedural and administrative matters not otherwise addressed in this Restriction shall be as set forth in the Rules and Regulations, as the same may be amended from time to time. In the case of a conflict between this Restriction and the Rules and Regulations, this Restriction shall apply.

5.3 No Legal Action. Neither the Declarant, nor any prospective purchaser, tenant, renter, occupant, or other party shall have the right to sue or bring other legal process against the Town of Jackson, Wyoming or the Housing Department, or any person affiliated with the Town of Jackson, Teton County, Wyoming, or the Housing Department arising out of this Restriction. Neither the Town of Jackson, Teton County, Wyoming, nor the Housing Department shall have any liability to any person aggrieved by the decision of the Town of Jackson, Teton County, Wyoming, or the Housing Department regarding eligibility of a Qualified Household or any other matter relating to this Restriction.

5.4 Restriction as a Covenant. This Restriction shall constitute covenants running with the Land and the Residential Unit, as a burden thereon, and shall be binding on all parties having any right, title, or interest in the Land, the Residential Unit, or any part thereof, their heirs, devisees, successors and assigns, and shall inure to the benefit of and shall be enforceable by JTCHA, the Housing Department, and the Town of Jackson, Wyoming.

5.5 Notices. All notices required to be served upon Declarant and Town of Jackson, Wyoming and shall be transmitted by one of the following methods: prepaid overnight courier; or by postage paid certified

mail, return receipt requested, at the address set forth below for said party. Notice shall be effective 1 day after being deposited with an overnight courier, or 5 business days after being placed in the mail.

To JTCHA / Housing Department:
Jackson/Teton County Affordable Housing Department
P.O. Box 714
Jackson, WY 83001

With a Copy to:
Town of Jackson, Wyoming.
Attn: Clerk
P.O. Box 1687
Jackson, WY 83001.

Declarant
To the Address on file with the Teton County Clerk's Office

5.6 Attorney's Fees. In the event any party shall be required to retain counsel and file suit for the purpose of enforcing the terms and conditions of this Restriction, the prevailing party shall be entitled to recover, in addition to any other relief recovered, a reasonable sum as determined by the court for attorney's fees and costs of litigation.

5.7 Incorporation of Recitals. All of the recitals hereof are incorporated by this reference and are made a part hereof as though set forth at length herein.

5.8 Choice of Law, Forum. This Restriction and each and every related document, are to be governed by and construed in accordance with the laws of the State of Wyoming. The parties agree that the appropriate court in Teton County, Wyoming and/or the Ninth Judicial District for the State of Wyoming shall have sole and exclusive jurisdiction over any dispute, claim, or controversy which may arise involving this Restriction or its subject matter. Declarant by accepting a deed for the Residential Unit hereby submits to the personal jurisdiction of any such court in any action or proceeding arising out of or relating to this Restriction.

5.9 Severability**.** Each provision of this Restriction and any other related document shall be interpreted in such a manner as to be valid under applicable law; but, if any provision, or any portion thereof, of any of the foregoing shall be invalid or prohibited under said applicable law, such provision shall be deemed modified to the extent necessary and possible to render it valid and enforceable, or if such modification is not possible, such provision shall be ineffective to the extent of such invalidity or prohibition without invalidating the remaining provision(s) of such document.

5.10 Section Headings**.** Paragraph or section headings within this Restriction are inserted solely for convenience or reference, and are not intended to, and shall not govern, limit or aid in the construction of any terms or provisions contained herein.

5.11 Waiver. No claim of waiver, consent or acquiescence with respect to any provision of this Restriction shall be valid against any party hereto except on the basis of a written instrument executed by the parties to this Restriction. However, the party for whose benefit a condition is inserted herein shall have the unilateral right to waive such condition.

5.12 Indemnification**.** Declarant shall indemnify, defend, and hold JTCHA, the Housing Department, and the Town of Jackson, Wyoming, and each entity's directors, officers, agents and employees harmless against any and all loss, liability, claim, or cost (including reasonable attorneys' fees and expenses) for damage or injury to persons or property from any cause whatsoever on or about the Residential Unit,

or for Declarant's breach of any provision of this Restriction. Declarant waives any and all such claims against JTCHA, the Housing Department and the Town of Jackson, Wyoming.

5.13 Successors and Assigns. This Restriction shall be binding upon, and inure to the benefit of, the parties hereto and their respective successors, heirs, devisees, administrators, and assigns.

5.14 Governmental Immunity. Neither the Town of Jackson, Wyoming nor the JTCHA or Housing Department waives governmental immunity by executing this Restriction and each specifically retain immunity and all defenses available to either of them as government pursuant to Wyo. Stat. Ann. § 1-39-104(a) and any other applicable law.

IN WITNESS WHEREOF, this Restriction shall be effective as of the date it is recorded in the Office of the Teton County, Wyoming Clerk (the "Effective Date").

Declarant: MOGUL HOSPITALITY PARTNERS - THE LOOP, LLC, a Delaware limited liability company

_____

By:
Its:

STATE OF WYOMING)
) ss.
COUNTY OF TETON)

On the _____ day of _____ 20____, the foregoing Restriction was acknowledged before me by _____ as _____ of MOGUL HOSPITALITY PARTNERS - THE LOOP, LLC, a Delaware limited liability company.

Witness my hand and official seal.

(Seal)

Notary Public

Town of Jackson

_____

Arne O. Jorgensen, Mayor

ATTEST:

_____

Riley Hovorka, Town Clerk

Exhibit A
Legal Description of Combined Tract

A parcel of land located within the Government Lots 1 and 2 of Section 6, T. 40 N., R. 116 W., 6th P.M., Teton County, Wyoming, being more particularly described by the following metes and bounds:

BEGINNING at a point on the south right-of-way line of South Park County Road No. 22-1, being coincident with the northeast corner of Parcel 2 as shown on Map T-311F recorded in the Office of the Clerk of Teton County, Wyoming, and marked by a 2.5-inch diameter aluminum cap inscribed "PLS 3831";

THENCE N 81°49'54" E, 281.15 feet, along said right-of-way line to a point marked by a 1-inch diameter iron pipe;

THENCE N 64°57'07" E, 134.01 feet, continuing along said right-of-way line to a point marked by steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE N 64°53'52" E, 81.58 feet, continuing along said right-of-way line to a point marked by a 1-inch diameter iron pipe;

THENCE N 50°29'02" E, 20.37 feet, continuing along said right-of-way line to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 26°55'20" E, 3.41 feet, departing said right-of-way line and along the line common to those tracts labeled "42P93 & 94" as shown on Map T-311D recorded in said Office, to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 26°55'20" E, 145.93 feet, continuing along said common line to a point marked by a 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 57°06'43" W, 89.24 feet, along the south line of the westerly tract labeled "42P93 & 94" as shown on Map T-311D, to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 57°23'05" W, 50.22 feet, along the south line of that tract labeled "105P749-751" to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 66°01'26" W, 68.79 feet, continuing along said south line to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 74°18'24" W, 78.52 feet, continuing along said south line to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 74°29'23" W, 21.50 feet, along the south line of that tract labeled "Edward J. & Margaret E Feuz" as shown on Map T-312A recorded in said Office, to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 71°16'36" W, 166.93 feet, continuing along said south to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 71°38'31" W, 92.38 feet, continuing along said south to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed “PLS 16012” set this survey;

THENCE N 9°45'35" W, 187.99 feet, along the line common to said tract labeled “Edward J. & Margaret E Feuz” and Parcels 3 and 2 as shown on said Map T-311F, to a point marked by a 1-inch diameter iron pipe

THENCE N 9°45'35" W, 9.42 feet, continuing along said common line to a point marked by a 2.5-inch diameter aluminum cap inscribed “PLS 3831”;

THENCE N 9°45'35" W, 7.59 feet, continuing along said common line to the **POINT OF BEGINNING**.

Said parcel encompasses 2.09 acres, more or less.

The basis of bearings for this description is S 9°45'35" E along the line common to that tract labeled “Edward J. & Margaret E Feuz” as shown on Map T-312A and Parcels 3 and 2 as shown on said Map T-311F, recorded in said Office.

All in accordance with that Map of Survey Boundary Line Adjustment prepared for Mogul Hospitality Partners – The Loop, LLC.

Exhibit B Amended and Restated The Loop East & West Buildings - Restricted Workforce - 2:1 Bonus Residential Unit Number, Numbers of Bedrooms per Unit, Workforce Designation		
Unit Number	Number of Bedrooms	Workforce Designation
E155	Two	2:1 Bonus
E151	Studio	2:1 Bonus
E137	Three	2:1 Bonus
E131	Two	2:1 Bonus
E107	Studio	2:1 Bonus
E109	Studio	2:1 Bonus
E130	One	2:1 Bonus
E132	Studio	2:1 Bonus
E134	Studio	2:1 Bonus
E138	Two	2:1 Bonus
E355	Two	2:1 Bonus
E351	Studio	2:1 Bonus
E337	Three	2:1 Bonus
E331	Two	2:1 Bonus
E307	Studio	2:1 Bonus
E309	Studio	2:1 Bonus
E334	Studio	2:1 Bonus
E338	Two	2:1 Bonus
W107	Studio	2:1 Bonus
W109	Studio	2:1 Bonus
W133	Two	2:1 Bonus
W157	Studio	2:1 Bonus
W147	Studio	2:1 Bonus
W143	Three	2:1 Bonus
W307	Studio	2:1 Bonus
W309	Studio	2:1 Bonus
W333	Two	2:1 Bonus
W357	Studio	2:1 Bonus
W353	Two	2:1 Bonus
W347	Studio	2:1 Bonus
W343	Three	2:1 Bonus

Exhibit C Amended and Restated The Loop East & West Buildings - Restricted Workforce - 4th Floor Exemption Units Residential Unit Number, Numbers of Bedrooms per Unit, Workforce Designation		
Unit Number	Number of Bedrooms	Workforce Designation
E262	Studio	Fourth Floor Exemption
E260	Studio	Fourth Floor Exemption
E258	Studio	Fourth Floor Exemption
E254	Three	Fourth Floor Exemption
E261	Three	Fourth Floor Exemption
E255	Two	Fourth Floor Exemption
E251	Studio	Fourth Floor Exemption
E244	Studio	Fourth Floor Exemption
E246	One	Fourth Floor Exemption
E237	Three	Fourth Floor Exemption
E231	Two	Fourth Floor Exemption
E238	Two	Fourth Floor Exemption
E234	Studio	Fourth Floor Exemption
E232	Studio	Fourth Floor Exemption
E230	Studio	Fourth Floor Exemption
E228	Studio	Fourth Floor Exemption
E226	Studio	Fourth Floor Exemption
E224	Studio	Fourth Floor Exemption
E222	Studio	Fourth Floor Exemption
E216	Three	Fourth Floor Exemption
E212	Studio	Fourth Floor Exemption
E210	Studio	Fourth Floor Exemption
E206	Two	Fourth Floor Exemption
E203	Two	Fourth Floor Exemption
E207	Studio	Fourth Floor Exemption
E209	Studio	Fourth Floor Exemption
W206	Two	Fourth Floor Exemption
W210	Studio	Fourth Floor Exemption
W212	Studio	Fourth Floor Exemption
W216	Three	Fourth Floor Exemption
W222	Studio	Fourth Floor Exemption
W224	Studio	Fourth Floor Exemption
W226	Studio	Fourth Floor Exemption
W228	Studio	Fourth Floor Exemption
W230	Studio	Fourth Floor Exemption
W234	Two	Fourth Floor Exemption
W233	Two	Fourth Floor Exemption
W229	Studio	Fourth Floor Exemption
W209	Studio	Fourth Floor Exemption
W207	Studio	Fourth Floor Exemption
W203	Three	Fourth Floor Exemption
W243	Three	Fourth Floor Exemption
W247	Studio	Fourth Floor Exemption
W253	Two	Fourth Floor Exemption
W257	Studio	Fourth Floor Exemption
W261	Three	Fourth Floor Exemption
W260	Two	Fourth Floor Exemption
W254	Two	Fourth Floor Exemption
W248	Studio	Fourth Floor Exemption
W244	Three	Fourth Floor Exemption

Workforce Rental Deed Restriction for Property
Located at _____
The Loop Apartments (West Building)

This Deed Restriction ("Restriction") is made and entered into this ___ day of _____, 20__, by the undersigned owner of the property ("Declarant") and Town of Jackson, Wyoming.

RECITALS:

WHEREAS, Declarant holds fee ownership interest in that certain real property, located in Town of Jackson, Wyoming, and more specifically described as follows:

See Exhibit "A" attached hereto and incorporated herein by reference

PIDN: _____("Land")

WHEREAS, Declarant participated in the Workforce Housing Floor Area Bonus tool pursuant to which in exchange for restricting the Land and the Residential Unit defined herein with a Workforce Program Restriction in accordance with the Jackson/Teton County Housing Department Rules and Regulations (defined below), Declarant received Additional development potential (Floor Area), all as more specifically set forth in the Rules and Regulations. Being a condition of approval for Permit No. B23-0292, in which Declarant received additional Floor Area, Declarant is restricting:

- See Exhibit "B"

WHEREAS, Declarant participated in the Workforce Housing Incentive for Additional Height tool (or a like successor) pursuant to which in exchange for restricting the Land and the Residential Unit defined herein with a Workforce Program Restriction in accordance with the Jackson/Teton County Housing Department Rules and Regulations (as defined below), Declarant received Additional development potential (Floor Area), all as more specifically set forth in the Rules and Regulations. Being a condition of approval for Permit No. B23-0292, in which Declarant received additional Floor Area, Declarant is restricting:

- See Exhibit "C"

The units described in Exhibit "B" and Exhibit "C" shall be referred to herein, together or individually, as a "Residential Unit").

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners resolved to form the Jackson/Teton County Housing Authority, a duly constituted housing authority pursuant to Wyo. Stat. §15-10-116, as amended, and its successors or assigns, known as the Jackson/Teton County Housing Authority ("JTCHA");

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners further resolved to create the Jackson/Teton County Affordable Housing Department ("Housing Department") who are employees of Teton County and agents acting on behalf of the JTCHA, empowered to enforce this Restriction;

WHEREAS, the Jackson Town Council and Teton County Board of County Commissioners have duly enacted the Jackson/Teton County Housing Department Rules and Regulations (defined below) and this Restriction is subject to such Rules and Regulations as they are amended from time to time;

WHEREAS, in furtherance of the goals, objectives, requirements, and conditions of Permit No. B23-0292, and consistent with the Town of Jackson's goal of providing decent, safe, and sanitary housing to qualified employees working in Teton County, Wyoming, that is affordable, Declarant agrees to restrict the use and occupancy of the Residential Unit as set forth herein;

WHEREAS, Declarant desires to record this Restriction and declare that the Residential Unit shall be held, sold, and conveyed in perpetuity subject to this Restriction and the Rules and Regulations, as they may be amended from time to time, which Restriction shall be in addition to all other covenants, conditions, or restrictions of record affecting the Residential Unit, and shall be enforceable by JTCHA and Town of Jackson, Wyoming. Furthermore, Declarant hereby declares that where the term "Declarant" is used in this Restriction it includes and means each and every subsequent owner, unless otherwise specifically clarified.

NOW, THEREFORE, in satisfaction of the conditions in and consideration of Permit No. B23-0292, Declarant hereby declares, covenants, and agrees for itself and each and every person acquiring ownership of the Land and/or Residential Unit, that they shall be held, used, occupied, developed, transferred, and conveyed subject to this Restriction in perpetuity.

ARTICLE I
RENTAL BY QUALIFIED HOUSEHOLD

1.1 Qualified Household. The rental of the Residential Unit shall be limited to natural persons who meet the definition of a Qualified Household, as set forth herein and as further defined in the Rules and Regulations ("Qualified Household").

1.1.1 Employment. At time of rental and in perpetuity during any and all rental periods, at least one member of the Qualified Household must work a minimum of 1,560 hours per year for a Local Business, as that term is defined in the Rules and Regulations.

1.1.2 Income Limit. At time of rental and in perpetuity during any and all rental periods, the Qualified Household must earn, at minimum, 75% of its income from a Local Business, as that term is defined in the Rules and Regulations. There is no maximum income or asset limit for Qualified Households.

1.1.3 Residential Real Estate. At time of rental and in perpetuity during any and all rental periods, no member of the Qualified Household may own (whether individually, in trust, or through an entity including without limitation a partnership, limited partnership, limited liability company, corporation, association, or the like) real estate except as set forth in the Rules and Regulations.

1.2 Qualification Determination by the Housing Department. The Housing Department shall determine, in its sole discretion, whether a prospective renter is a Qualified Household. The Department shall use written applications, representations, and information to make the determination, which shall include the verification of those materials as necessary and appropriate to establish and substantiate eligibility.

ARTICLE II
OCCUPANCY, IMPROVEMENT, AND USE

2.1 Rules and Regulations Applicability. Unless otherwise explicitly provided herein, all applicable limitations on occupancy, improvement, and use set forth in the Rules and Regulations, apply to the Residential Unit.

2.2 Business Activity. No business activities shall be carried out in a Residential Unit, except to the extent allowed in the Rules and Regulations.

2.3 Guests. No persons other than those comprising the Qualified Household, as set forth in the Rules and Regulations, may occupy the Residential Unit.

2.4 Maintenance. Declarant shall be responsible for the cost and expense to keep and maintain the interior of the Residential Unit, and all other aspects of the Residential Unit not otherwise maintained by a homeowner's association in a safe, decent, and sanitary condition pursuant to the Rules and Regulations. In the event Declarant fails to maintain the Residential Unit in a safe, decent, and sanitary condition, the Housing Department may take action, and be reimbursed for costs thereof, all as set forth in the Rules and Regulations.

2.5 Insurance. Declarant shall keep the Residential Unit continuously insured as set forth in the Rules and Regulations. Declarant shall, as often as necessary to prove compliance herewith at all times, furnish and deposit with the Housing Department certificates of such insurance policy to be maintained by Declarant with evidence of payment of the premiums thereon.

2.6 Compliance with Laws and CC&Rs. The Residential Unit shall be occupied in full compliance with this Restriction; the Rules and Regulations; all laws, statutes, codes, rules, regulations of state, local, and federal law; Covenants, Conditions & Restrictions; and all supplements and amendments thereto.

2.7 Inspection. Upon reasonable notice to Declarant, the Housing Department shall have the right to inspect the Residential Unit from time to time as set forth in the Rules and Regulations.

2.8 Records. Declarant shall maintain records of service, rental, repair, and maintenance for a period of 2 years after their issuance. The Housing Department shall have the right to review the written records required to be maintained by Declarant.

2.9 Renting. The Residential Unit may be rented to the extent allowed in the Rules and Regulations. In addition to that set forth in the Rules and Regulations, the Residential Unit must be rented for a minimum period of 180 days. Declarant shall set the rental rate. There is no cap on rent or rent appreciation.

2.10 Periodic Reporting. In order to confirm compliance with this Restriction, the Rules and Regulations, and other covenants, regulations, ordinances, or rules governing the ownership, occupancy, use, improvement, or transfer of the Residential Unit, Declarant shall timely comply with information requests, application material submission, and all supplemental requests as set forth in

the Rules and Regulations. If the Declarant rents the Unit, the Declarant is responsible for timely compliance with all reporting requirements.

2.11 Occupancy. The Residential Unit must be occupied as the Qualified Household's sole and exclusive primary residence, and they must physically reside therein on a full-time basis pursuant to the Rules and Regulations.

2.12 No Owner Occupancy. Declarant shall not reside in or occupy the Residential Unit. For purposes of this paragraph, if Declarant is an entity (including without limitation, a partnership, limited partnership, Limited Liability Company, corporation, association, or other) or a trust, this prohibition on owner-occupancy extends to any partner, member, shareholder, other principal or owner of the entity, and any trustee or beneficiary of the trust.

ARTICLE III
SALE

3.1 Sale of The Residential Unit. The Residential Unit may be bought and sold, except that all reporting and record-keeping required herein shall be continuous and any new owner shall obtain the required records from the prior owner. Every conveyance of the Residential Unit shall be subject to this Restriction. Within 10 days prior to the closing of the sale or other transfer of the Residential Unit, seller shall notify the Housing Department of the pending sale or transfer and, prior to closing, provide the Housing Department with contact information (including without limitation, mailing address, phone number and email) for the purchaser.

ARTICLE IV
TERMINATION, AMENDMENT, CORRECTION

4.1 Termination by the Town of Jackson, Wyoming. This Restriction may be terminated after a determination by the Town of Jackson, Wyoming that this Restriction is no longer consistent with the goal of providing affordable housing.

4.2 Amendment. This Restriction may be amended by a signed, written amendment executed by both the Town of Jackson, Wyoming and Declarant and recorded in the Teton County Clerk's Office against title to the Residential Unit.

4.3 Correction. JTCHA may unilaterally correct this Restriction to address scrivener's errors, erroneous legal descriptions, or typographical errors.

ARTICLE V
GENERAL PROVISIONS

5.1 Breach.

5.1.1 Breach Defined. Each of the following shall be considered a breach hereof ("Breach").

5.1.1.1 A violation of this Restriction, the Rules and Regulations, the Declaration of Covenants, Conditions & Restrictions, or any rule or law a violation of which could result in a lien recorded against a Residential Unit.

5.1.1.2 Failure to pay any financial obligation due or failure to perform a non-monetary obligation with respect to the Residential Unit which failure to pay or perform could result in a lien recorded against a Residential Unit. This includes, without limitation, homeowner dues, property taxes, contractor and servicer bills, and payment required by a promissory note secured by a mortgage recorded against a Residential Unit. Declarant shall notify the Housing Department in writing of any notification received from any party of past due payments or failure to perform within ten (10) calendar days of the date on the first notice of any such failure to pay or perform.

5.1.1.3 The Residential Unit is taken by execution or by other process of law, or Declarant is judicially declared insolvent, or Declarant assigns or attempts to assign the property for the benefit of creditors, a receiver, trustee, or other similar officer being appointed to take charge of any substantial part of the Residential Unit or Declarant's property by a court of competent jurisdiction.

5.1.1.4 Fraud or material misrepresentation by Declarant or an occupant (with Declarant's knowledge) in the provision of information or documents included in an application, or additional submissions of requested documentation by the Housing Department, and related to the mission, goals, objectives, requirements, and conditions of JTCHA and its programs.

5.1.2 Administrative Process. Upon any alleged Breach, the parties must proceed in accordance with the default process set forth in the Rules and Regulations, as they may be amended from time to time.

5.1.3 Court Enforcement. After exhausting the administrative process required by Article 5.1.2 any order of the Housing Authority Board may be appealed via a court of competent jurisdiction.

5.1.4 Breach Remedies. If the Residential Unit is or becomes legally recognized as an independent lot of record after the execution of this Restriction, concurrent with the recordation of a plat condominiumizing the Residential Unit, this Section (Breach Remedies) shall be amended to incorporate additional breach remedies consistent with the Rules and Regulations in place at the time of condominiumization.

JTCHA may, at its discretion, invoke any remedies available to it and seek any such relief, at law or equity, as may be appropriate, including but not limited to, specific performance of this Restriction and the Rules and Regulations; temporary, permanent, or preliminary injunctive relief (including prohibiting a proposed sale or transfer); a declaration that a sale or transfer is void; and monetary damages. Any equitable relief may be sought singly or in combination with such other remedies the JTCHA may be entitled to, either pursuant to this Restriction, the Rules and Regulations, the applicable Land Development Regulations, or under the local, state, or federal law.

5.1.5 Hold Harmless. In the event of a Breach, Declarant hereby holds the Town of Jackson, Wyoming, JTCHA, and the Housing Department, their officials, employees, and agents harmless against any and all claims, suits, or actions of every name, kind, and description and any other loss or cost, including but not limited to that caused by the concurrent active or passive negligence of the Town of Jackson or Teton County, Wyoming, JTCHA, and the Housing Department, their officials, employees, and agents.

5.1.6 Reimbursement. In the event of a Breach, Declarant hereby agrees to reimburse the actual expenses, attorney's fees, and costs for any action the JTCHA and/or Housing Department expends to enforce this Restriction.

5.2 Jackson/Teton County Housing Department Housing Rules and Regulations. The term "Rules and Regulations" is defined as the Jackson/Teton County Housing Department Rules and Regulations, as the same may be amended from time to time and which are codified in the Municipal Code of the Town of Jackson, and enacted by resolution of Teton County, Wyoming pursuant to the Wyoming Administration Procedures Act. If there are no such written policies, procedures, or guidelines (or a written policy, procedure, or guideline with respect to a specific matter) then the reference shall be to the current applied policy or policies of the Housing Department or its successor. Procedural and administrative matters not otherwise addressed in this Restriction shall be as set forth in the Rules and Regulations, as the same may be amended from time to time. In the case of a conflict between this Restriction and the Rules and Regulations, this Restriction shall apply.

5.3 No Legal Action. Neither the Declarant, nor any prospective purchaser, tenant, renter, occupant, or other party shall have the right to sue or bring other legal process against the Town of Jackson, Wyoming or the Housing Department, or any person affiliated with the Town of Jackson, Teton County, Wyoming, or the Housing Department arising out of this Restriction. Neither the Town of Jackson, Teton County, Wyoming, nor the Housing Department shall have any liability to any person aggrieved by the decision of the Town of Jackson, Teton County, Wyoming, or the Housing Department regarding eligibility of a Qualified Household or any other matter relating to this Restriction.

5.4 Restriction as a Covenant. This Restriction shall constitute covenants running with the Land and the Residential Unit, as a burden thereon, and shall be binding on all parties having any right, title, or interest in the Land, the Residential Unit, or any part thereof, their heirs, devisees, successors and assigns, and shall inure to the benefit of and shall be enforceable by JTCHA, the Housing Department, and the Town of Jackson, Wyoming.

5.5 Notices. All notices required to be served upon Declarant and Town of Jackson, Wyoming and shall be transmitted by one of the following methods: prepaid overnight courier; or by postage paid certified mail, return receipt requested, at the address set forth below for said party. Notice shall be effective 1 day after being deposited with an overnight courier, or 5 business days after being placed in the mail.

To JTCHA / Housing Department:
Jackson/Teton County Affordable Housing Department
P.O. Box 714
Jackson, WY 83001

With a Copy to:
Town of Jackson, Wyoming.
Attn: Clerk
P.O. Box 1687
Jackson, WY 83001.

Declarant
To the Address on file with the Teton County Clerk's Office

5.6 Attorney's Fees. In the event any party shall be required to retain counsel and file suit for the purpose of enforcing the terms and conditions of this Restriction, the prevailing party shall be entitled to recover, in addition to any other relief recovered, a reasonable sum as determined by the court for attorney's fees and costs of litigation.

5.7 Incorporation of Recitals. All of the recitals hereof are incorporated by this reference and are made a part hereof as though set forth at length herein.

5.8 Choice of Law, Forum. This Restriction and each and every related document, are to be governed by and construed in accordance with the laws of the State of Wyoming. The parties agree that the appropriate court in Teton County, Wyoming and/or the Ninth Judicial District for the State of Wyoming shall have sole and exclusive jurisdiction over any dispute, claim, or controversy which may arise involving this Restriction or its subject matter. Declarant by accepting a deed for the Residential Unit hereby submits to the personal jurisdiction of any such court in any action or proceeding arising out of or relating to this Restriction.

5.9 Severability. Each provision of this Restriction and any other related document shall be interpreted in such a manner as to be valid under applicable law; but, if any provision, or any portion thereof, of any of the foregoing shall be invalid or prohibited under said applicable law, such provision shall be deemed modified to the extent necessary and possible to render it valid and enforceable, or if such modification is not possible, such provision shall be ineffective to the extent of such invalidity or prohibition without invalidating the remaining provision(s) of such document.

5.10 Section Headings. Paragraph or section headings within this Restriction are inserted solely for convenience or reference, and are not intended to, and shall not govern, limit or aid in the construction of any terms or provisions contained herein.

5.11 Waiver. No claim of waiver, consent or acquiescence with respect to any provision of this Restriction shall be valid against any party hereto except on the basis of a written instrument executed by the parties to this Restriction. However, the party for whose benefit a condition is inserted herein shall have the unilateral right to waive such condition.

5.12 Indemnification. Declarant shall indemnify, defend, and hold JTCHA, the Housing Department, and the Town of Jackson, Wyoming, and each entity's directors, officers, agents and employees harmless against any and all loss, liability, claim, or cost (including reasonable attorneys' fees and expenses) for damage or injury to persons or property from any cause whatsoever on or about the Residential Unit, or for Declarant's breach of any provision of this Restriction. Declarant waives any and all such claims against JTCHA, the Housing Department and the Town of Jackson, Wyoming.

5.13 Successors and Assigns. This Restriction shall be binding upon, and inure to the benefit of, the parties hereto and their respective successors, heirs, devisees, administrators, and assigns.

5.14 Governmental Immunity. Neither the Town of Jackson, Wyoming nor the JTCHA or Housing Department waives governmental immunity by executing this Restriction and each specifically retain immunity and all defenses available to either of them as government pursuant to Wyo. Stat. Ann. § 1-39-104(a) and any other applicable law.

IN WITNESS WHEREOF, this Restriction shall be effective as of the date it is recorded in the Office of the Teton County, Wyoming Clerk (the "Effective Date").

Declarant: MOGUL HOSPITALITY PARTNERS - THE LOOP, LLC, a Delaware limited liability company

_____

By:
Its:

STATE OF WYOMING)
) ss.
COUNTY OF TETON)

On the _____ day of _____ 20____, the foregoing Restriction was acknowledged before me by _____ as _____ of MOGUL HOSPITALITY PARTNERS - THE LOOP, LLC, a Delaware limited liability company.

Witness my hand and official seal.

(Seal)

Notary Public

Town of Jackson

_____

Arne O. Jorgensen, Mayor

ATTEST:

_____

Riley Hovorka, Town Clerk

Exhibit A
Legal Description of Combined Tract

A parcel of land located within the Government Lots 1 and 2 of Section 6, T. 40 N., R. 116 W., 6th P.M., Teton County, Wyoming, being more particularly described by the following metes and bounds:

BEGINNING at a point on the south right-of-way line of South Park County Road No. 22-1, being coincident with the northeast corner of Parcel 2 as shown on Map T-311F recorded in the Office of the Clerk of Teton County, Wyoming, and marked by a 2.5-inch diameter aluminum cap inscribed "PLS 3831";

THENCE N 81°49'54" E, 281.15 feet, along said right-of-way line to a point marked by a 1-inch diameter iron pipe;

THENCE N 64°57'07" E, 134.01 feet, continuing along said right-of-way line to a point marked by steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE N 64°53'52" E, 81.58 feet, continuing along said right-of-way line to a point marked by a 1-inch diameter iron pipe;

THENCE N 50°29'02" E, 20.37 feet, continuing along said right-of-way line to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 26°55'20" E, 3.41 feet, departing said right-of-way line and along the line common to those tracts labeled "42P93 & 94" as shown on Map T-311D recorded in said Office, to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 26°55'20" E, 145.93 feet, continuing along said common line to a point marked by a 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 57°06'43" W, 89.24 feet, along the south line of the westerly tract labeled "42P93 & 94" as shown on Map T-311D, to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 57°23'05" W, 50.22 feet, along the south line of that tract labeled "105P749-751" to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 66°01'26" W, 68.79 feet, continuing along said south line to a point marked by a steel T-stake with a chrome cap inscribed "PE & LS 2612;

THENCE S 74°18'24" W, 78.52 feet, continuing along said south line to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 74°29'23" W, 21.50 feet, along the south line of that tract labeled "Edward J. & Margaret E Feuz" as shown on Map T-312A recorded in said Office, to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 71°16'36" W, 166.93 feet, continuing along said south to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 71°38'31" W, 92.38 feet, continuing along said south to a point marked by a 24-inch long, 5/8-inch diameter rebar with a 2-inch diameter aluminum cap inscribed “PLS 16012” set this survey;

THENCE N 9°45'35" W, 187.99 feet, along the line common to said tract labeled “Edward J. & Margaret E Feuz” and Parcels 3 and 2 as shown on said Map T-311F, to a point marked by a 1-inch diameter iron pipe

THENCE N 9°45'35" W, 9.42 feet, continuing along said common line to a point marked by a 2.5-inch diameter aluminum cap inscribed “PLS 3831”;

THENCE N 9°45'35" W, 7.59 feet, continuing along said common line to the **POINT OF BEGINNING**.

Said parcel encompasses 2.09 acres, more or less.

The basis of bearings for this description is S 9°45'35" E along the line common to that tract labeled “Edward J. & Margaret E Feuz” as shown on Map T-312A and Parcels 3 and 2 as shown on said Map T-311F, recorded in said Office.

All in accordance with that Map of Survey Boundary Line Adjustment prepared for Mogul Hospitality Partners – The Loop, LLC.

Exhibit B

The Loop West Building - Restricted Workforce - 2:1 Bonus

Residential Unit Number, Numbers of Bedrooms per Unit, Workforce Designation

Unit Number	Number of Bedrooms	Workforce Designation
W107	Studio	2:1 Bonus
W109	Studio	2:1 Bonus
W133	Two	2:1 Bonus
W157	Studio	2:1 Bonus
W147	Studio	2:1 Bonus
W143	Three	2:1 Bonus
W307	Studio	2:1 Bonus
W309	Studio	2:1 Bonus
W333	Two	2:1 Bonus
W357	Studio	2:1 Bonus
W353	Two	2:1 Bonus
W347	Studio	2:1 Bonus
W343	Three	2:1 Bonus

Exhibit C

The Loop West Building - Restricted Workforce - Fourth Floor Exemption

Residential Unit Number, Numbers of Bedrooms per Unit, Workforce Designation

Unit Number	Number of Bedrooms	Workforce Designation
W206	Two	Fourth Floor Exemption
W210	Studio	Fourth Floor Exemption
W212	Studio	Fourth Floor Exemption
W216	Three	Fourth Floor Exemption
W222	Studio	Fourth Floor Exemption
W224	Studio	Fourth Floor Exemption
W226	Studio	Fourth Floor Exemption
W228	Studio	Fourth Floor Exemption
W230	Studio	Fourth Floor Exemption
W234	Two	Fourth Floor Exemption
W233	Two	Fourth Floor Exemption
W229	Studio	Fourth Floor Exemption
W209	Studio	Fourth Floor Exemption
W207	Studio	Fourth Floor Exemption
W203	Three	Fourth Floor Exemption
W243	Three	Fourth Floor Exemption
W247	Studio	Fourth Floor Exemption
W253	Two	Fourth Floor Exemption
W257	Studio	Fourth Floor Exemption
W261	Three	Fourth Floor Exemption
W260	Two	Fourth Floor Exemption
W254	Two	Fourth Floor Exemption
W248	Studio	Fourth Floor Exemption
W244	Three	Fourth Floor Exemption

PRIMARY LEASE AGREEMENT

This Primary Lease Agreement ("**Lease**" or "**Primary Lease**") is made and entered into this _____ day of _____, 2025, by and between Teton County, Wyoming, a duly organized county of the State of Wyoming ("**Landlord**") and the City of Jackson, a municipal corporation of the State of Wyoming ("**Tenant**"). Landlord and Tenant are each a "**Party**" to the Lease and are collectively the "**Parties**."

RECITALS

WHEREAS, Landlord is the owner of certain real property, a building, and other appurtenances attached thereto located at 3182 Adams Canyon Drive, Jackson, Wyoming 83001, which is also known as the Adam's Canyon Bunkhouse;

WHEREAS, Landlord desires to lease the fully furnished apartment unit located within the building, which is more particularly described as an apartment unit with seven (7) bedrooms, three (3) bathrooms, a kitchen, living room, and a laundry area with a washer and dryer, together with all other improvements located therein (collectively the "**Premises"**);

WHEREAS, Tenant desires to lease the Premises; and

WHEREAS, the Parties desire to enter into a written lease agreement providing the terms, covenants, and conditions for the lease and occupancy of the Premises by Tenant.

NOW, THEREFORE, in consideration of the mutual covenants, agreements, undertakings, and benefits to the Parties, the Parties agree as follows:

AGREEMENT

1. LEASE. Landlord agrees to lease to Tenant and Tenant agrees to lease from Landlord the Premises according to the terms and conditions of this Lease.

2. TERM. The Lease shall begin on November 1, 2025, and end on April 30, 2026, unless sooner terminated as provided herein (the "Term").

3. RENT. Tenant agrees to pay Landlord rent in the amount of Six Thousand One Hundred Forty-six Dollars ($6,146) for each month during the Term, payment for which will begin on November 1. All rent payments are due and payable on the first day of each month during the Term. Rent shall be paid no later than the tenth day of each month.

4. SECURITY DEPOSIT. Tenant shall pay a security deposit equal to one (1) month's rent. The security deposit shall be paid by the time the Term commences. Landlord shall hold the security deposit for the Term. The security deposit shall be retained by the Landlord to be used for any of the following that occur during the Term: (i) any damages, other than normal wear and tear, caused by Tenant, (ii) any missing or damaged furnishings, furniture, or items, other than normal wear and tear, from the Premises, (iii) any unpaid rent, fees, or charges, (iv) abandonment of the Premises, (v) cleaning expenses required to return the Premises to as good a condition as it was upon commencement of this Lease, and/or (vi) to the extent permitted by Wyoming law, any other costs or damages sustained by the Landlord by reason of the failure of the Tenant to comply with any terms, provisions, covenants, or agreements contained in this Lease. It is understood that the security deposit is not a pre-payment of rent and is not applicable toward

the last month's rent. The Landlord shall not be obligated (although it may do so at its option) to apply the security deposit to any unpaid rent, fees, charges, or portion thereof at the termination of the Lease. Landlord shall return that portion of the security deposit not used for one of the above-listed deductions no later than thirty (30) days following the termination of this Lease, provided that, if the security deposit is being applied to any permissible circumstance, this time period shall be extended by an additional thirty (30) days. Tenant shall be liable for any damages or expenses owed in excess of the security deposit. Landlord shall promptly provide Tenant with written notice of the amount owed by Tenant, and Tenant shall pay said amount within thirty (30) days of notice.

5. SUBLEASE. Tenant has the right to sublease the Premises in its entirety or by the room, subject to the following terms and conditions:

a. Sublessees. The maximum number of sublessees Tenant may sublease the Premises to at any given time is thirteen (13) sublessees.

b. Eligible Sublessees. Tenant may sublease the Premises, in order of preference, to Town of Jackson employees, interns, or contractors, Teton County employees, interns, or contractors approved by Landlord, or other persons locally employed in Teton County, Wyoming.

c. Compliance with Primary Lease. Sublessees shall be subject to and bound by the terms and conditions of the Primary Lease as if the sublessees entered and executed the Primary Lease themselves as the Tenant. Notwithstanding the foregoing, Tenant will remain solely responsible to Landlord regarding Section 3 (Rent), Section 4 (Security Deposit), and for any other deposits or financial payments required to be paid to the Landlord under the Lease. Tenant and sublessees shall be jointly and severally responsible for all other terms and conditions of the Primary Lease.

d. Other Occupants. A sublessee may occupy and reside in the Premises alone, or with their spouse, partner, immediate family member, or with a housemate if agreed to in writing by Tenant. The rights of any permitted occupants are governed by the terms and conditions of the Primary Lease, and such rights shall expire or terminate at the same time the sublessee's rights expire or terminate.

e. Sublessee Background Check. Prior to Tenant entering a sublease, Tenant shall provide any information and releases requested by Landlord for Landlord to assess the suitability of a proposed sublessee and occupants and to conduct a tenant background check on the proposed sublessee and occupants. Based on Landlord's assessment and/or the results of the tenant background check, Landlord, in its sole discretion, may reject any proposed sublessee and/or occupant. Landlord shall provide Tenant 48 hours to offer input prior to rejecting a sublessee and/or occupant. Landlord shall work with Tenant to complete the assessment and background checks promptly.

f. Sublessee Information. At least five (5) days prior to a sublessee's move-in date, Tenant shall provide written notice to Landlord with the following information for the sublessee, and any permitted occupants: move-in date, move-out date, name, email, cell phone number, vehicle make and model, vehicle license plate. If a sublessee's move-out date is extended, Tenant shall promptly provide Landlord with written notice of the extended move-out date.

6. MOVE IN INSPECTION WORKSHEET. Tenant shall complete and execute a Move-In Inspection Worksheet ("Worksheet") within fourteen (14) days of the commencement of the Term. The Worksheet shall provide a detailed accounting of the condition of the Premises, including, but not limited to, repairs needed, damages, or material defects. If there are any furnishings, furniture, or items contained in the Premises, the Worksheet shall also document an inventory and a detailed accounting of the conditions of such furnishings, furniture, and items. If a Worksheet is not completed by the Tenant in the

time specified, this may result in the Tenant being held responsible for all issues noted by Landlord at the end of the Term.

7. USE OF PREMISES. Tenant agrees and acknowledges that their use of the Premises is conditioned upon the following:

a. Shall comply with all requirements of any governmental authorities, housing authorities, or homeowner associations concerning the Premises now or hereafter in force.
b. Shall comply with rules or regulations made by Landlord from time-to-time for the safety, care, upkeep, and cleanliness of the Premises.
c. Do not place auxiliary structures of any kind on the Premises without the express written consent of the Landlord.
d. Do not install any satellite dishes, cable, or permanent or semi-permanent communication services on, in, or attached to any portion of the Premises.
e. Do not touch, climb on, access, utilize, or otherwise interfere with any Town or County owned equipment, items, or facilities located adjacent to, in, or around the Premises.
f. May not use the Premises as a business address or for the purpose of conducting any type of business, profession, or trade ("Business Activities") without the prior express written consent of the Landlord.
g. Shall keep radios, televisions, stereos, other audio devices, etc., at a level of sound that does not annoy or interfere with other residents or neighbors.
h. Do not permit any liens or security interests to be filed against the Premises.

8. NO ILLEGAL OR PROHIBITED CONDUCT. Tenant shall not use or permit the use of the Premises contrary to any federal, state, or local law or engage in any activity in or on the Premises that is illegal under any federal, state, or local law. Tenant shall not engage in or permit in or on the Premises disruptive conduct, noisy disturbances, abusive language, intimidating behavior, bullying behavior, threatening behavior, violent acts, any other conduct that jeopardizes the health, safety, and/or welfare of Landlord, Landlord's agents, other tenants, neighbors, any other person, or property, or otherwise disturb or interfere with the rights of other tenants or neighbors. If this section is violated, the violator is subject to immediate eviction. If Landlord elects to immediately evict the violator, Landlord shall provide Tenant written notice of the eviction and Tenant will have three (3) days from the date of the notice for the violator to vacate the Premises, unless Landlord agrees in writing to extend the time to vacate.

9. ALTERATION AND IMPROVEMENTS. Tenant shall not make any alterations or improvements to the Premises without the advanced written consent of the Landlord.

10. REPAIR AND MAINTENANCE. Tenant shall keep the Premises, including the common areas, in as good order as it was at the time of the commencement of the Term, reasonable wear and tear, damage by elements, accidental fire or other casualty excepted. Tenant will immediately notify Landlord of any damage to the Premises or its contents, or to any inoperable equipment or appliances, and such damage or inoperable equipment or appliance shall be promptly repaired at no expense to the Tenant, except as indicated below. Tenant will be responsible for any damage caused by the Tenant, or Tenant's sublessee, family members, invitees, or guests. Tenant agrees to be responsible for the following maintenance of the Premises:

a. Keep all windows, glass, window treatments, doors, locks, and hardware in good, clean order and repair.
b. Do not obstruct or cover the windows or doors, with the exception of conventional window treatments.

c. Do not leave windows or doors in an open position during inclement weather.
d. Do not hang laundry, clothing, sheets, etc. from any window, rail, porch, or balcony, nor air or dry any of the same within any yard area.
e. Do not hang anything from any exposed sprinkler system, or otherwise make use of any exposed sprinkler system in any way.
f. Do not cause or permit any locks or hooks to be placed upon any door, except for child locks.
g. Take reasonable precautions to avoid freezing pipes and plumbing fixtures.
h. Keep all lavatories, sinks, toilets, and all other water and plumbing apparatus in good order and repair, and use the same only for the purposes for which they were constructed. No sweepings, garbage, sand, rags, ashes, or other substances shall be thrown or deposited therein. Any damage to any such apparatus and the cost of clearing stopped plumbing resulting from misuse shall be borne by Tenant.
i. Deposit all trash, garbage, rubbish, and refuse in the locations provided therefor and not allow any trash, garbage, rubbish, or refuse to be deposited or permitted to stand on the exterior of any building.
j. Keep the Premises, including the common areas, both inside and out, in good, clean, orderly, and sanitary condition.
k. Do not store or accumulate items along the exterior walls.
l. Do not permit any hazardous, toxic, or flammable substances to be stored or used in or about the Premises.
m. Do not disconnect the smoke/fire alarm and/or any other detectors in the Premises.
n. Utilize the exhaust fans in the bathroom and kitchen areas at a level sufficient to prohibit the growth of mold in these areas or other areas prone to condensation.
o. Shall be responsible for the arrangement, completion, and funding of any minor repair or maintenance that costs up to $100.00 to complete.

11. SNOW REMOVAL. All snow and ice removal will be provided by the Landlord with no obligation to the Tenant. Tenant shall promptly notify Landlord of any ice or snow issues.

12. YARD MAINTENANCE. All yard maintenance will be provided by the Landlord with no obligation to the Tenant. Tenant shall promptly notify Landlord of any yard maintenance issues.

13. UTILITIES. All utilities are included in the rent. No internet is available.

14. HOMEOWNERS ASSOCIATION FEES AND PROPERTY TAXES. The landlord is solely responsible for any homeowners' association fees. Landlord shall pay all property taxes on the Premises as they become due and payable.

15. CONVENANT OF QUIET ENJOYMENT. The Landlord covenants that the Tenant, upon paying rent and performing the covenants upon its part to be performed hereunder, shall peaceably and quietly have, hold, and enjoy the Premises. Nonetheless, Tenant acknowledges that the Premises is located by other Teton County grounds and facilities. Tenant understands, agrees, and accepts that there will be sounds associated with the use and maintenance of these grounds and facilities that may occur at all hours of the day.

16. OVERNIGHT GUESTS. Overnight guests may stay in or on the Premises for no more than seven (7) consecutive nights. No overnight visitation by a guest who has visited for a seven (7) night period may occur more than twice during each Term of Occupancy of the Lease.

17. ANIMALS. No animals are allowed except service animals, and assistance animals are allowed in accordance with Wyoming State and Federal law. A pet deposit is not required for a service animal or assistance animal. Tenant may be liable for any damage caused by the service animal or assistance animal to the extent allowed under Wyoming State and Federal law.

18. SMOKING. No smoking is permitted in or on the Premises at any time.

19. PARKING. Eight (8) parking spaces shall be available to the Tenant, and the Tenant shall only park in the spaces designated by the Landlord.

20. INSPECTION/ENTRY. Landlord shall have the right to enter the Premises for reasonable inspections, to make any agreed upon or necessary repairs/improvements, to show the Premises to prospective Tenants or contractors, if Landlord believes the Premises have been abandoned, or where other good cause exists to enter. The Landlord shall give the Tenant at least twenty-four (24) hours' advance notice of entry, except in the event of an emergency or where another cause exists. For major repairs or improvements that will disrupt the occupancy of the Tenant for more than one (1) day, the Landlord shall give the Tenant and the Tenant's sublessees at least seven (7) days' advance notice of entry. Notwithstanding the foregoing, Landlord shall have the right to enter and inspect the Premises and take appropriate action without advance notice in the event of any emergency.

21. INSURANCE. Landlord shall maintain, at its expense, fire, comprehensive general liability, and extended "all-risk" coverage on the Premises.

22. PERSONAL PROPERTY AND RENTER'S INSURANCE. Landlord shall not be responsible for loss, destruction, or damage to Tenant's or Tenant's sublessee's personal property, regardless of the cause. Tenant shall ensure that all sublessees of the Premises have knowledge of the option to obtain a renter's insurance policy. Landlord and Tenant shall have no responsibility for payment of any renter's insurance policy by a sublessee.

23 DESTRUCTION OF PREMISES. If the Premises shall be damaged by fire, elements, unavoidable accident, or other casualty, without the fault or negligence of Tenant or Tenant's sublessee, and the Premises are not thereby rendered untenantable in whole or in part, Landlord shall promptly, at its expense, cause such damage to be repaired, and the rent shall not be abated. If, by reason of such occurrence, the Premises shall be rendered untenantable only in part, Landlord shall promptly cause the damage to be repaired and the rent, during such period of repair, shall be abated proportionately to the portion of the Premises rendered untenantable. If, by reason of such occurrence, the Premises shall be rendered wholly untenantable, Landlord shall promptly cause such damage to be repaired and the rent, during such period of repair, shall be abated in whole. There shall be no extension of the term of this Lease by reason of such abatement. Notwithstanding the foregoing provisions, if the Premises shall be rendered wholly untenantable by reason of such occurrence and the Premises cannot be repaired within six (6) months from the date such damage occurs, Landlord or Tenant shall at their option have the right to declare the balance of the term of this Lease to be null and void.

24. SURRENDER AND CLEANING. Upon the completion of the Term, Tenant shall quit and surrender the Premises in as good condition and repair as it was at the date of the commencement of the Term, reasonable wear and tear excepted. Tenant is responsible for cleaning so that at surrender the Premises are in as good a condition and repair as at the commencement of the Term, and, if cleaning is

required by the Landlord to meet this standard, Landlord may deduct the cost of such from the security deposit. If the cost of cleaning exceeds the amount of the security deposit, Tenant will be responsible and charged for the additional cleaning costs.

25. BINDING EFFECT. All the terms, covenants, and conditions of this Lease shall be binding upon and inure to the benefit of the Parties hereto, their respective heirs, assigns, and legal representatives.

26. REPRESENTATIONS. It is mutually agreed that no representations, warranties, covenants, or agreements, expressed or implied, have been made other than those set forth herein.

27. WAIVER. The waiver by the Parties of any breach of any term, covenant, or condition herein contained shall not be deemed to be a waiver of such term, covenant, or condition or any subsequent breach of the same or any other condition herein contained. None of the terms hereof can be waived by either of the Parties, except by an appropriate written agreement duly executed by both Parties.

28. DEFAULT. Tenant shall be in default if Tenant shall fail to pay any part of the rent herein provided, or any other sum required by the Lease to be paid at the times or in the manner provided under the Lease or otherwise, or where any covenant, term, or condition of this Lease is materially violated. If default is not cured within ten (10) days of written notice, then Landlord may immediately terminate this Lease, provided that, if by its nature the default cannot be cured within ten (10) days, but Tenant commences the cure within that time and perfects it thereafter, no immediate termination may be effectuated. The Landlord reserves all rights and remedies available to them under the law in the event of default.

29. INDEMNIFICATION. Landlord shall not be liable for any damage, injury, or loss to person or persons occurring on the Premises unless such act is the result of the negligence of the Landlord. Tenant agrees to hold Landlord harmless from any claims for damages, injury, or loss to person or persons occurring on the Premises, except for damages, injury, or loss caused by the negligence of Landlord.

30. GOVERNMENTAL IMMUNITY. The Parties do not waive their governmental immunity by entering into this Lease, and fully retain all immunities and defenses provided by law with respect to any action based on or occurring as a result of this Lease.

31. ATTORNEY'S FEES. The Parties agree that in the event either Party incurs court costs or attorney's fees by reason of default or breach by the other Party, the prevailing Party in any such court action shall be entitled to reasonable attorney's fees and court costs from the other.

32. NOTICES. Any notice, request, demand, consent, approval, or other communication required or permitted under this Lease shall be in writing and shall be deemed duly given (i) when delivered personally to the recipient, (ii) when sent by certified mail, return receipt requested, to the address specified below, or (iii) when sent by email to the email address specified below, provided that the sender has not received a delivery failure notification. A notice sent by email shall be deemed received on the date and time the email is sent, provided that (a) the email is sent to the recipient's designated email address as set forth below, (b) the sender does not receive a bounce-back or delivery failure notification, and (c) if the notice is sent outside of normal business hours (9:00 AM to 6:00 PM on business days), the notice shall be deemed received at 9:00 AM on the following business day. Either Party may change its address or

email address for notice purposes by providing written notice to the other Party in accordance with the terms of this provision.

LANDLORD	TENANT
	Town of Jackson
Teton County	
P.O. Box 1687	P.O. Box 3594
Jackson, WY 83001	Jackson, WY 83001
jpond@tetoncountywy.gov	employeehousing@jacksonwy.gov

33. SEVERABILITY. If any part of this Lease shall be construed to be unenforceable, invalid, or illegal, such unenforceability, invalidity, or illegality shall not affect any other provisions, and they shall remain in full force and effect.

34. ENTIRE AGREEMENT. This Lease constitutes the complete and entire agreement between the Parties and may be modified only in writing and duly signed by the Parties.

35. LAW AND JURISDICTION. This Lease shall be construed in accordance with the laws of the State of Wyoming. Any litigation arising under the terms of the Lease shall be in the state courts of the State of Wyoming, Ninth Judicial District. Any forcible entry and detainer action shall be brought in the Circuit Court of Teton County, Wyoming.

36. CONSTRUCTION. Whenever used, the singular shall include the plural, the plural the singular, and the use of any gender shall include all genders when the context so requires. This Lease was negotiated by both Parties and thus it shall not be construed against or in favor or any Party by virtue of which party drafted it or any portion thereof.

37. HEADINGS. The headings used in this Lease are for convenience only and are not to be used in its construction.

38. COUNTERPARTS; ELECTRONIC SIGNATURES. This Lease may be executed simultaneously in two or more counterparts, each of which shall be deemed an original and all of which, when taken together, constitute one and the same document. The signature of any Party to any counterpart shall be deemed a signature to, and may be appended to, any other counterpart. Counterparts may be delivered via facsimile, electronic mail (including pdf or any electronic signature complying with the federal ESIGN Act of 2000, e.g., www.docusign.com) or other transmission method, and any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes. At the request of either Party, each Party agrees to execute an original of this Lease as well as any facsimile or other reproduction hereof.

39. INCORPORATION OF RECITALS. All the recitals hereof are incorporated by this reference and are made a part hereof as though set forth at length herein.

IN WITNESS WHEREOF, each Party acknowledges they have read and understood all the terms of this Lease and hereby agree to be bound thereby. The Parties further acknowledge that they were under no duress

in signing this Lease and had full opportunity to negotiate the terms contained herein and to consult independent counsel.

LANDLORD:

Teton County

Mark Newcomb, Chairman
Wes Gaudur, vice chair

Attest:
Roze Roberts on behalf of
Maureen Murphy

Maureen E. Murphy
Teton County Clerk

STATE OF WYOMING
COUNTY CLERK
TETON COUNTY

TENANT:

City of Jackson

Arne O. Jorgensen, Mayor

Attest:

Riley Hovorka
Town Clerk

BUS STORAGE LEASE BETWEEN TOWN OF JACKSON
AND
WESTERN TRAILS CHARTER AND TOURS DBA SALT LAKE EXPRESS

This Bus Storage Lease Agreement (Agreement) is made and entered into, effective as of November 26, 2025, by and between the Town of Jackson (Landlord), located at 150 East Pearl Avenue Jackson, Wyoming 83001 and Western Trails Charter and Tours, dba Salt Lake Express (Tenant), located at 785 Railroad Avenue Rexburg, Idaho 83440. (Landlord and Tenant are each a "Party" to this Agreement and are collectively the "Parties").

RECITALS:

WHEREAS, Landlord owns certain real property situated at 55 Karns Meadow Drive Jackson, Wyoming 83001 ("Property"); and

WHEREAS, Tenant desires to store a certain number of its buses on a portion of the Property ("Premises"); and

WHEREAS, Landlord desires to rent the Premises to Tenant, and Tenant desires to rent the Premises from Landlord, upon the terms and conditions provided herein.

NOW, THEREFORE, the Parties hereto hereby agree as follows:

1. TERM. This Agreement begins on November 26, 2025 and concluding on April 14, 2026, or until such time as this Agreement is terminated in accordance with the terms herein. Tenant may take possession on the beginning date of the term.
2. RENT. Tenant agrees to pay Landlord rent in the amount of $20.00 per day/ per bus.
3. STORAGE LOCATION. No greater than 3 buses shall be stored on the Premises as set forth in Exhibit A. Landlord reserves the right to relocate the storage location on the Property at any time with 24 hours' notice to Tenant.
4. USE OF PREMISES; OCCUPANTS. The Premises may only be used and occupied by Tenant for the purpose of storing its buses. Tenant may not allow any person other than its employees to enter or stay upon the Premises, or to permit activities other than those appurtenant to bus storage upon the Premises without written consent of Landlord.
5. CONDITION OF PREMISES. Tenant stipulates, represents, and warrants that Tenant accepts the Premises in their existing condition, and agrees that the Premises are, at the time of this Agreement, in good order, repair, and in a safe, clean, and tenantable condition.
6. ASSIGNMENT, SUBLETTING. Tenant may not assign this Agreement or sub-let or grant any license to use the Premises or any part thereof without the prior written consent of Landlord.
7. ALTERATIONS AND IMPROVEMENTS. Tenant may not make any alterations to the Premises or construct any building or make any other improvements on the Premises without the prior written consent of Landlord.
8. TENANT CONDUCT AND RESPONSIBILITIES. Unless otherwise stated, Tenant will, at its sole expense, keep and maintain the Premises in good and sanitary condition and repair during this Agreement. Tenant's

responsibilities include, without limitation, the following, and any departure therefrom requires Landlord's prior written consent:

a. Obey all rules and regulations provided by Landlord regarding the use and care of the Premises.

b. Keep all driveways clear and accessible.

c. Not place placards, signs, or other exhibits on the Premises.

d. Maintain order on the Premises, and not making, or permitting employees to make loud noises that disturb the surrounds or otherwise create a nuisance.

e. Keep the Premises clean and tidy, removing garbage, rubbish, and refuse and not allowing said items to be deposited or accumulate on the Premises.

9. MAINTENANCE; LANDLORD RESPONSIBILITIES. Landlord agrees to maintain the Premises in a safe and habitable condition, with such costs being borne by Landlord unless the repairs were necessitated by the negligence or intentional acts of Tenant.

10. DAMAGE TO PREMISES; COST TO REPAIR. Damage to the Premises by Tenant, invitees, agents, or guests thereof, will be grounds for termination of this Agreement. Furthermore, Tenant is required to pay the costs of repair for all damages it causes to the Premises over and above reasonable wear and tear.

11. OBLIGATION TO NOTIFY. Tenant will immediately notify Landlord of any accidents, dangerous conditions, or hazards on the Premises that have caused, are causing, or may cause injury or damage to the Premises or persons or property located therein.

12. INSURANCE. It is acknowledged that Landlord does not maintain insurance for Tenant's property damage or loss caused by any reason whatsoever. Landlord is not responsible for any loss or damage to property owned by Tenant or Tenant's guests or invitees, unless resulting from Landlord's intentional or negligent acts.

13. ENTRY OF PREMISES. Landlord and Landlord's agents will have the right at all reasonable times during the term of this Agreement to enter the Premises for the purposes of making any inspections, repairs, or improvements as may be deemed appropriate by Landlord or required by law; to supply agreed services; to address an emergency; or as otherwise reasonably needed by Landlord. Tenant agrees to make the Premises available to Landlord or Landlord's agents for purposes permitted under this Agreement. No advance notice is required for Landlord’s entry upon the Premises.

14. TERMINATION. Either Landlord or Tenant may terminate this Agreement upon 30 days’ written notice.

15. SURRENDER OF PREMISES. Upon the termination or expiration of the Agreement, Tenant must surrender the Premises in the same state and condition as they were at the commencement of this Agreement, except that Tenant will not be responsible for damage due to reasonable wear and tear.

16. QUIET ENJOYMENT. If Tenant remains in compliance with the terms of this Agreement, Landlord covenants that Tenant will peacefully and quietly have, hold, and enjoy the Premises.

17. INDEMNIFICATION. Landlord will not be liable, and Tenant hereby waives all claims against Landlord, for any damage to any property or any injury to any person in or about the Premises by or from any cause whatsoever, except to the extent caused by or arising from the gross negligence or willful misconduct of Landlord or its agents, employees, or contractors. Tenant agrees to protect, indemnify and hold Landlord

entities harmless from and against any and all loss, claims, liability or costs (including court costs and attorney's fees) incurred by reason of (a) any damage to any property or any injury to any person occurring in, on, or about the Premises to the extent that such injury or damage is caused by or arises from any actual or alleged act, neglect, fault, or omission by or of Tenant, its agents, servants, invitees, or visitors to meet any standards imposed by any duty with respect to the injury or damage; (b) the conduct or management of any work or thing whatsoever done by the Tenant in or about the Premises; (c) Tenant's failure to comply with any and all governmental laws, ordinances and regulations applicable to the condition or use of the Premises; and (d) any breach or default on the part of Tenant in the performance of any covenant or agreement on the part of Tenant to be performed pursuant to this Agreement. The provisions of this paragraph will survive the termination of this Agreement with respect to any claims or liability accruing prior to such termination.

18. REIMBURSEMENT. If Tenant fails or refuses to comply with any of the terms and conditions of this Agreement, Landlord may carry out and perform such conditions at the cost and expense of Tenant, which amounts will be payable on demand to Landlord. This remedy will be in addition to such other remedies as Landlord may have by reason of the breach by Tenant of any of the terms and conditions of this Agreement.

If Landlord fails or refuses to comply with any of the terms and conditions of this Agreement, Tenant may carry out and perform such conditions at the cost and expense of Landlord, which amounts will be payable on demand to Tenant. This remedy will be in addition to such other remedies as Tenant may have by reason of the breach by Landlord of any of the terms and conditions of this Agreement.

19. NOTICE. Any notice, request, demand, consent, approval, or other communication required or permitted under this Lease shall be in writing and shall be deemed duly given (i) when delivered personally to the recipient, (ii) when sent by certified mail, return receipt requested, to the address specified below, or (iii) when sent by email to the email address specified below, provided that the sender has not received a delivery failure notification. A notice sent by email shall be deemed received on the date and time the email is sent, provided that (a) the email is sent to the recipient's designated email address as set forth below, (b) the sender does not receive a bounce-back or delivery failure notification, and (c) if the notice is sent outside of normal business hours (9:00 AM to 6:00 PM on business days), the notice shall be deemed received at 9:00 AM on the following business day. Legal counsel for the respective parties may send to the other party any notices, requests, demands, or other communications required or permitted to be given hereunder by such party.

CARRIER	START
Western Trails Charters and Tours	Town of Jackson
785 Railroad Ave_____	P.O. Box 1687
Rexburg, Idaho 83440	Jackson, WY 83001
lisa.young@saltlakeexpress.com	clerk@jacksonwy.gov.

20. GENERAL TERMS

a. Binding Effect of Agreement, Modification and Waiver. This Agreement shall inure to the benefit of and be binding upon the successors and assigns of the parties hereto. No modification of the terms of this Agreement shall be valid unless in writing and executed by the parties hereto, and no waiver of the breach of the provisions of any section of this Agreement shall be construed as a waiver of any subsequent breach of the same section or any other sections which are contained herein.

b. Severability. This Agreement is to be governed and construed according to the laws of the State of Wyoming. In the event that any provision of this Agreement is held to be in violation of Town, state or federal laws and hereby rendered invalid or unenforceable as to any party or circumstance, such finding shall not render that provision invalid or unenforceable as to any other persons or circumstances. If feasible, any such offending provision shall be deemed to be modified to be within the limits of enforceability or validity; however, if the offending provision cannot be so modified, it shall be stricken and all other provisions of this Agreement in all other respects shall remain valid and enforceable.

c. Integration. The parties intend this statement of their agreement, including the Recitals herein, to constitute the complete, exclusive, and fully integrated statement of their agreement. As such, it is the sole expression of their agreement, and they are not bound by any other agreements of whatsoever kind or nature.

d. Additional Documents and Acts. Each party agrees to execute and deliver such additional documents and instruments and to perform such additional acts as may be necessary or appropriate to effectuate, carry out and perform all of the terms, provisions, and conditions of this Agreement and the transactions contemplated hereby.

e. Conflict of Laws, Jurisdiction, Construction. This Agreement shall be constructed, performed and enforced in accordance with, and governed by, the laws of the State of Wyoming, without giving effect to the principles of conflict of laws thereof. The parties hereto irrevocably elect as the sole judicial forum for the adjudication of any matters arising under or in connection with this Agreement, and consent to the jurisdiction of, the courts of the County of Teton, State of Wyoming, or the United States District Court for the District of Wyoming. This Agreement was negotiated by both parties and thus it shall not be construed against or in favor of any party by virtue of which party drafted it or any portion thereof.

f. Governmental Immunity. The Town of Jackson does not waive its governmental immunity by entering into this Agreement, and fully retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of this Agreement.

g. Counterparts; Digital Signatures. This Contract may be executed in two or more counterparts, each of which shall be deemed an original having identical legal effect, and all of which together constitute the same instrument. The signature of any party to any counterpart shall be deemed a signature to, and may be appended to, any other counterpart. Counterparts may be delivered via facsimile, electronic mail (including pdf or any electronic signature complying with the federal ESIGN Act of 2000, e.g., www.docusign.com) or other transmission method, and any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes. At the request of either Party, each Party agrees to execute an original of this Contract as well as any facsimile or other reproduction hereof

TENANT:

WESTERN TRAILS CHARTER AND TOURS, DBA SALT LAKE EXPRESS

By:

Its: _____

LANDLORD:

TOWN OF JACKSON

_____
BY: Arne O. Jorgenson, Mayor

ATTEST

_____
Riley Hovorka, Town Clerk

TERMINATION OF REVOCABLE LICENSE FOR CHAIRLIFT SEATING
(Home Ranch)

THIS TERMINATION OF REVOCABLE LICENSE FOR CHAIRLIFT SEATING ("Termination") is made and entered into on this ____ day of October, 2025 (the "*Effective Date*"), by and between the Town of Jackson, Wyoming, a municipal corporation of the State of Wyoming, and its successors and assigns, having a mailing address of P.O. Box 1687, Jackson, Wyoming 83001 ("*Licensor*")and Jackson Hole Public Art, a Wyoming 501C(3) corporation, and its successors and assigns, with a mailing address of P.O. Box 4413, Jackson, Wyoming 83001 ("*Licensee*").

RECITALS

WHEREAS, that certain Revocable License for Chairlift Seating Street dated April 18, 2025, ("*Existing License*") granted a license over that certain real property known as Lots 1 Thru 6 & 9 Thru 14 BLK 2 & Lots 1 Thru 6 BLK 3, W.W. Smith Plat, Parcel 22-41-16-27-3-22-001, described in Exhibit A attached hereto and incorporated herein by reference ("*Subject Property*");

WHEREAS, said Existing License was granted for chairlift seating to be located on the Subject Property in accordance with Exhibit A; and

WHEREAS, the parties acknowledge that the chairlift seating was not located on the Subject Property consistent with Exhibit A; and

WHEREAS, the parties desire to terminate the Existing License and grant a new license to memorialize the actual and exact location of the chairlift seating.

NOW, THEREFORE, that for and in consideration of the aforesaid recitals, which are incorporated herein by this reference as if set forth in their entirety below and in consideration for good and valuable consideration, in hand paid, the receipt and sufficiency of which is hereby acknowledged and confessed, Licensor and Licensee do hereby agree as follows:

1. Termination of Existing License. The parties hereby terminate the Existing License in its entirety.
2. Effective Date. This termination shall be effective as of the Effective Date.
3. Authorization. The undersigned each represent and warrant that they have the authority to execute this Termination and that no other consents are required to effectuate this termination.

[REMAINDER OF PAGE IS INTENTIONALLY BLANK]

In witness whereof, the Parties have executed this Termination.

LICENSEE:

Jackson Hole Public Art,
a Wyoming 501C (3) corporation

By: _____
Carrie Geraci, Executive Director
Jackson Hole Public Art

STATE OF WYOMING)
) ss.
COUNTY OF TETON)

This foregoing instrument was acknowledged before me on _____, 2025 by Carrie Geraci, in their capacity as Executive Director of Jackson Hole Public Art, who is personally known to me or has established their identity and authority to me by reasonable proof.

_____
Notary Public
My commission expires: _____

LICENSOR:
TOWN OF JACKSON

_____
By: Arne O. Jorgensen
Its: Mayor

ATTEST:

_____
By: Riley Hovorka
Its: Town Clerk

STATE OF WYOMING)
)ss
COUNTY OF TETON)

This foregoing instrument was acknowledged before me by Arne O. Jorgensen and Riley Hovorka, as the Mayor and Town Clerk of the Town of Jackson, respectively, who are each personally known to me or have each established their identity and authority to me by reasonable proof, this _____ day of _____, 2025.

_____
Notary Public
My commission expires: _____

EXHIBIT A

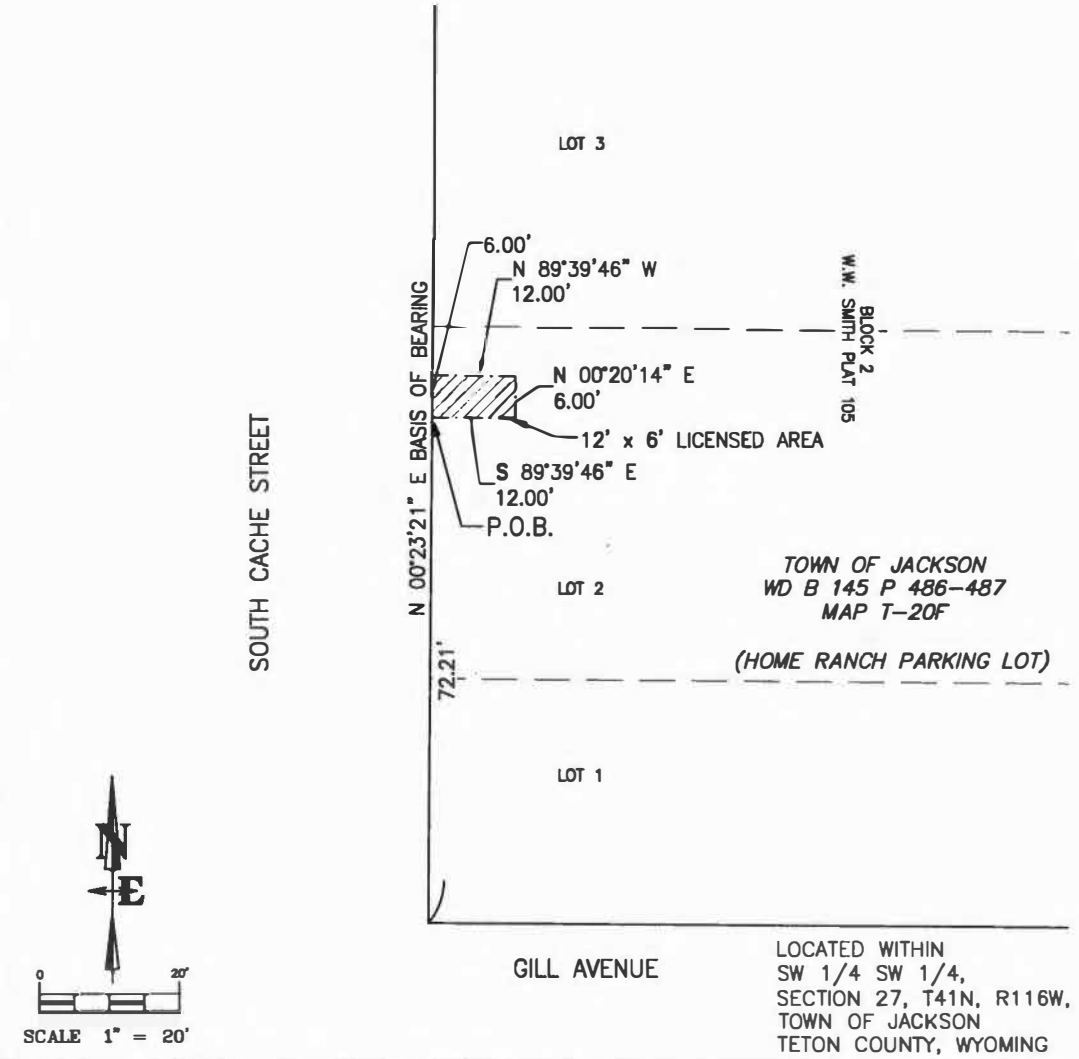
A 6 foot by 12 foot wide Licensed Area located within the SW 1/4 SW 1/4, Section 27, Township 41 North, Range 116 West, 6th P.M., Town of Jackson, Teton County, Wyoming, said strip being located within Lot 2 of Block 2, of W.W. Smith Plat No. 105, a lot of land as described in Warranty Deed, Book 145, pages 486–487, records of the Office of the Teton County Clerk, and being described as follows:

Beginning at a point on the easterly right–of–way of South Cache Street it being N00°20'14"E, a distance of 72.21 feet from the southwest corner of Lot 1 of Said W.W. Smith Plat;
Thence S89°39'46"E, a distance of 12 feet;
Thence N00°20'14"E, a distance of 6 feet;
Thence N89°39'46"W, a distance of 12 feet to Said easterly right–of–way;
Thence S00°20'14"W, a distance of 6 feet to the Point of Beginning.

Said Licensed Area contains 72 square feet, more or less, and is subject to any easements, rights–of–way, reservations or restrictions of sight and/or of record.

The Basis of Bearing being N00°20'14"E along the easterly right–of–way line of South Cache Street.

As shown hereon and by this reference made a part hereof.



LOCATED WITHIN
SW 1/4 SW 1/4,
SECTION 27, T41N, R116W,
TOWN OF JACKSON
TETON COUNTY, WYOMING

DRAWING NO: 1	DRAWING TITLE: SNOW KING CHAIR LICENSED AREA	NELSON ENGINEERING	DATE: 08/22/2022
JOB NO: 22-040-01	TOWN OF JACKSON	P.O. BOX 1599, JACKSON WYOMING (307) 733-2087	ENGINEERED:
	HOME RANCH WELCOME CENTER		DRAWN: SK
			CHECKED: DS
			APPROVED: DS

REVOCABLE LICENSE FOR CHAIRLIFT SEATING (Home Ranch)

This Revocable License for Chairlift Seating ("***Agreement***") is made and entered into on this ____ day of October, 2025 (the "***Effective Date***"), by and between the Town of Jackson, Wyoming, a municipal corporation of the State of Wyoming, and its successors and assigns, having a mailing address of P.O. Box 1687, Jackson, Wyoming 83001 and Jackson Hole Public Art, a Wyoming 501C(3) corporation, and its successors and assigns, with a mailing address of P.O. Box 4413, Jackson, Wyoming 83001 ("***Licensee***").

RECITALS

WHEREAS, Licensor is the owner of real property located in Teton County, Wyoming, and described more fully as:

Street Address:	210 North Cache Street
Legal Description:	Lots 1 Thru 6 & 9 Thru 14 BLK 2 & Lots 1 Thru 6 BLK 3, W.W. Smith Plat 105 (Home Ranch Parking Lot)
PIDN:	22-41-16-27-3-22-001

*("**Licensor's Property**");*

WHEREAS, the Town of Jackson is a municipal corporation that supports the incorporation of public artwork in the Town of Jackson as it promotes a sense of community, and improves the quality of life for persons living, working, and visiting the Town of Jackson;

WHEREAS, Licensee is a non-profit organization that places artwork projects in public spaces, and desires to install an artwork project comprised of restored Snow King Mountain chairlift chairs in the form of a bench or swing ("***Chairlift Seating***") on Licensor's property; and

WHEREAS, Licensor desires to grant a license to and for the benefit of Licensee and the public for the installation, maintenance, and use of the chairlift seating artwork project on that portion of Licensor's Property described and shown on Exhibit A, attached hereto and made a part hereof by this reference (the "***License Area***").

NOW, THEREFORE, for and in consideration of the aforesaid recitals, which are incorporated herein by this reference as if set forth in their entirety below, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, Licensor and Licensee agree as follows:

1. Grant of License. Licensor hereby grants to Licensee a revocable license during the Term (as defined below) to use and occupy the License Area for installing, constructing, inspecting, repairing, maintaining, removing, replacing, and reinstalling the Chairlift Seating ("***License Purpose***"). Licensee, its agents, employees, and contractors shall have the right of ingress and egress to and from the License Area across the Licensor's Property for the License Purpose. In the event Licensee fails to construct and install the Chairlift Seating within 18 months of the Effective date, this Agreement shall automatically terminate.

2. Term of Agreement. This Agreement shall take effect on the Effective Date and shall expire on December 31, 2038 ("***Term***"), unless an extension is agreed to in writing by both parties.

3. Limitations on Licensee Use. Licensee shall exercise its rights granted herein with due regard to the rights of others and shall not use the License Area in a way that would impair the rights of Licensor or others. Licensee's activities authorized by this Agreement will be undertaken in a fashion so as not to unreasonably interfere with Licensor's use of Licensor's Property.

4. Cost; Maintenance. Licensee shall exclusively be responsible at its sole expense for installing, constructing, inspecting, repairing, maintaining, removing, replacing, and reinstalling the Chairlift Seating. Licensor shall be responsible for daily upkeep for the grounds around the Chairlift Seating (landscaping), to include snow removal from the License Area.

   Licensee shall give Licensor at least 14 calendar days' advance written notice of its intent to exercise its privilege under this Agreement for any planned installation, construction, inspection, repair, maintenance, removal, replacement, and reinstallation work regarding the Chairlift Seating. Notwithstanding the foregoing, no such notice shall be required for emergency or unplanned work; however, Licensee shall use reasonable efforts to notify Licensor of its intent to exercise its right under this Agreement for such emergency or unplanned work.

5. Revocable License; Removal. At any time during the Term, upon 90 days' prior written notice given by Licensor to Licensee, or at the expiration of the Term, whichever is sooner, Licensee shall remove the Chairlift Seating and all of its other materials and equipment from the License Area and the license granted hereunder shall be deemed revoked. Upon removal of the Chairlift Seating, the License Area shall be restored in accordance with paragraph 6.

6. Restoration. Licensee covenants and warrants that within 30 days of completion of any of Licensee's work on the License Area, including removal of the Chairlift Seating, Licensee shall, at Licensee's sole cost and expense, restore the surface of the License Area disturbed by Licensee's work to the condition it was in immediately prior to the commencement of its work by Licensee.

7. Ownership. Licensee is the owner of the Chairlift Seating and shall retain such ownership rights for the duration of the Term. At the end of the Term, the parties shall come to an agreement on the disposition and final ownership of the Chairlift Seating.

8. Compliance with Laws, Rules, and Regulations. Licensee shall comply with and require its employees, agents, and contractors to comply with all applicable laws, ordinance, and regulations, including but not limited to all applicable regulatory, environmental, and safety requirements in its use of the License Area during the Term at Licensee's sole cost and expense.

9. Indemnification. Licensee agrees to indemnify, defend and hold harmless Licensor, their respective officials, directors, officers, employees, agents successors and assigns ("*Indemnified Parties*") from and against any and all liabilities, loss, claims, demands, liens, damages, penalties, fines, costs and expenses, including reasonable attorneys' fees in connection with loss of life, personal injury, and/or damage to property (collectively, "*Losses*"), arising out of or attributable to use of the License Area by Licensee and its employees, agents, contractors, licensees, and invitees (including all users of the Chairlift Seating) during the Term, unless such Losses are caused solely by the willful misconduct or gross negligence of Licensor or their employees or agents. Nothing in this Agreement shall alter, amend, modify, or diminish the existing statutory, constitutional, or legal defenses of the Licensor in relation to such claims under Wyoming law.

10. Notices. All notices or other communications to be given to the parties to this Agreement shall be transmitted by one of the following methods: prepaid overnight courier; or by postage paid certified mail, return receipt requested, to the addresses noted above, or at such other address as one party notifies the other in writing pursuant to this Section. Notice shall be effective 1 day after being deposited with an overnight courier, or 5 business days after being placed in the mail.

11. Successors and Assigns. This Agreement binds and shall inure to the benefit of the parties and their heirs, assigns, and successors in interest.

12. Governing Law; Jurisdiction; Construction. This Agreement shall be constructed, performed, and enforced in accordance with, and governed by, the laws of the State of Wyoming, without giving effect to the principles of conflict of laws thereof. The parties hereto irrevocably elect as the sole judicial forum for the adjudication of any matters arising under or in connection with this Agreement, and consent to the jurisdiction of, the courts of the County of Teton, State of Wyoming, or the United States District Court for the District of Wyoming.

13. Severability. In case any one or more of the provisions contained in this Agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision hereof, and this Agreement shall be construed as if such invalid, illegal, or unenforceable provision had never been contained herein

14. Entire Agreement; Modification. This Agreement embodies and constitutes the entire agreement with respect to the subject matters hereof and all prior or contemporaneous agreements, understandings, representations, statements are merged into this Agreement. Neither this Agreement nor any provision hereof may be modified or amended, in whole or in part, unless agreed to in writing by the parties hereto.

15. Enforcement; Remedies. Licensor and Licensee shall be entitled to enforce this Agreement by specific performance, injunction, or by bringing an action for damages. The prevailing party in an action brought under this Agreement shall be entitled to recover from the other party, as the case may be, reasonable attorneys' fees and costs, in addition to all other relief provided by law or in equity.

16. Immunity. Licensor does not waive its immunity by entering this Agreement, and fully retains all immunities and defenses provided by law with respect to any action based on or arising out of this Agreement.

17. Counterparts; Digital Signatures. This Agreement may be executed simultaneously in two or more counterparts, each of which shall be deemed an original and all of which, when taken together, constitute one and the same document. The signature of any party to any counterpart shall be deemed a signature to, and may be appended to, any other counterpart. Counterparts may be delivered via facsimile, electronic mail (including pdf or any electronic signature complying with the federal ESIGN Act of 2000, e.g., www.docusign.com) or other transmission method, and any counterpart so delivered shall be deemed to have been duly and validly delivered and be valid and effective for all purposes. At the request of either Party, each Party agrees to execute an original of this Agreement as well as any facsimile or other reproduction hereof.

18. Authority. The individuals executing this Agreement warrant and represent that they are duly authorized to execute and deliver this Agreement.

LICENSEE:

Jackson Hole Public Art,
a Wyoming 501C (3) corporation

By: _____
Carrie Geraci, Executive Director
Jackson Hole Public Art

STATE OF WYOMING)
) ss.
COUNTY OF TETON)

This foregoing instrument was acknowledged before me on _____, 2025 by Carrie Geraci, in their capacity as Executive Director of Jackson Hole Public Art, who is personally known to me or has established their identity and authority to me by reasonable proof.

_____
Notary Public
My commission expires: _____

LICENSOR:

TOWN OF JACKSON

_____
By: Arne O. Jorgensen
Its: Mayor

ATTEST:

_____
By: Riley Hovorka
Its: Town Clerk

STATE OF WYOMING)
)ss
COUNTY OF TETON)

This foregoing instrument was acknowledged before me by Arne O. Jorgensen and Riley Hovorka, as the Mayor and Town Clerk of the Town of Jackson, respectively, who are each personally known to me or have each established their identity and authority to me by reasonable proof, this _____ day of _____, 2025.

_____
Notary Public
My commission expires: _____

EXHIBIT A

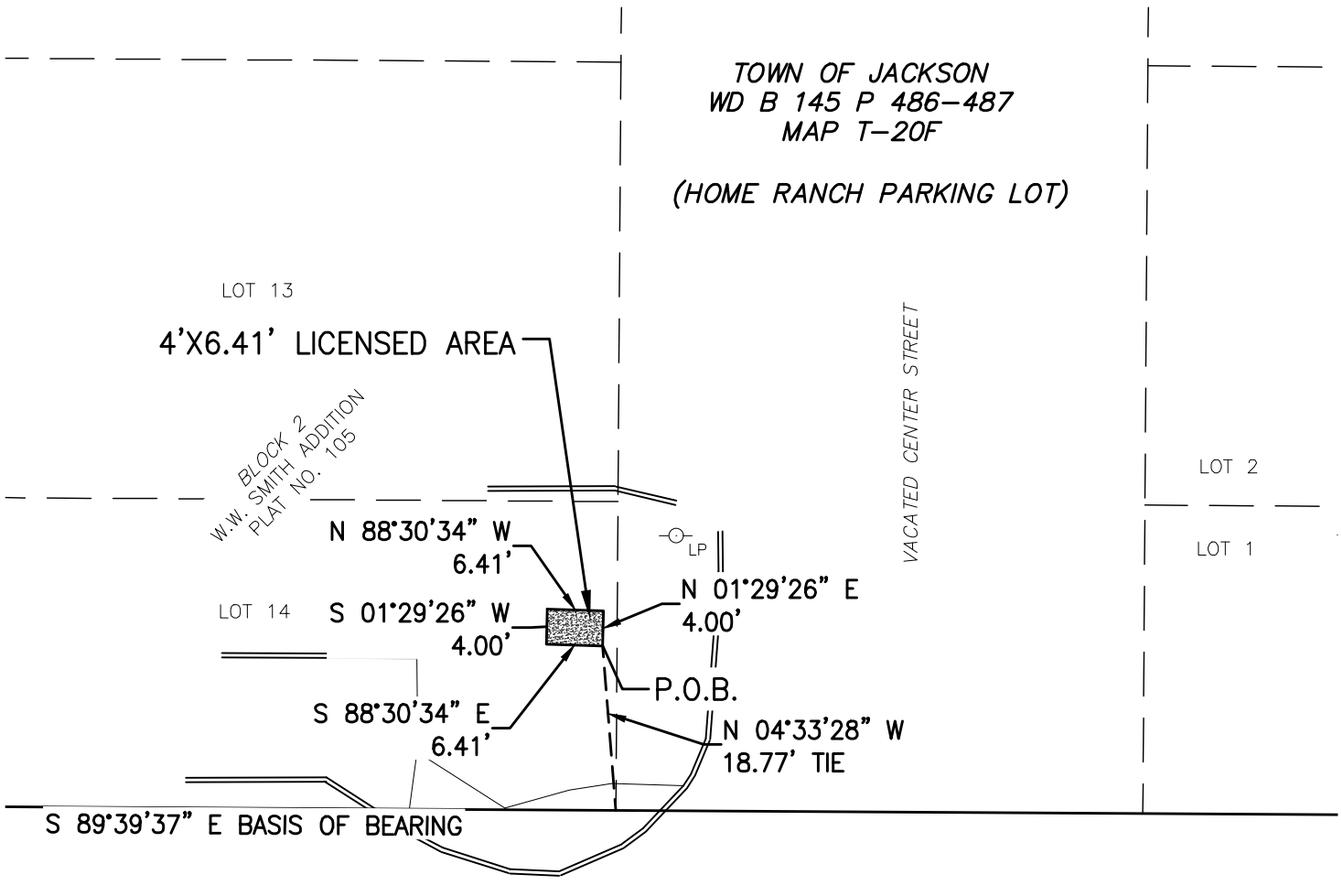
A 4 foot by 6.41 foot wide Licensed Areas located within the SW 1/4 SW 1/4, Section 27, Township 41 North, Range 116 West, 6th P.M., Town of Jackson, Teton County, Wyoming, and being located within Lot 14 of Block 2, of W.W. Smith Addition Plat No. 105, property as described in Warranty Deed, Book 145, page 486–487, records of the Office of the Teton County Clerk, and being described as follows:

Beginning at a point being N04°33'28"W, a distance of 18.77 feet from the southeast corner of Said Lot 14;
Thence N01°29'26"E, a distance of 4 feet;
Thence N88°30'34"W, a distance of 6.41 feet;
Thence S01°29'26"W, a distance of 4 feet;
Thence S88°30'34"E, a distance of 6.41 feet to the Point of Beginning.

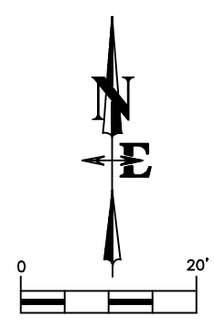
Said Licensed Area contains 25.64 square feet, more or less, and is subject to any easements, rights–of–way, reservations or restrictions of sight and/or of record.

The Basis of Bearing being S89°39'37"E along the southerly line of Block 2 of Said Plat No. 105.

As shown hereon and by this reference made a part hereof.



GILL AVENUE



SCALE 1" = 20'

LOCATED WITHIN
SW 1/4 SW 1/4,
SECTION 27, T41N, R116W, 6th P.M.
TOWN OF JACKSON
TETON COUNTY, WYOMING

DRAWING NO: 1	DRAWING TITLE: SNOW KING CHAIR LICENSED AREA TOWN OF JACKSON HOME RANCH PARKING LOT	NELSON ENGINEERING P.O. BOX 1599, JACKSON WYOMING (307) 733–2087	DATE: 7/22/2025 ENGINEERED: DRAWN: SK CHECKED: LR APPROVED: LR
JOB NO: 22–040–01			

S:\PROJECTS\22-040-1\SURVEY\EASEMENTS & EXHIBITS\EXHIBIT A-SECTION\NW\PSN\LEEPER LANE\ALLEY.DWG 05.2024 GEORGE.D DEC 19 2023 12:49:13 PM

FIRST AMENDMENT TO THE SOCIAL SERVICE CONTRACT BETWEEN THE TOWN OF JACKSON AND JACKSON HOLE PUBLIC ART (FY 2025-2026)

This First Amendment to the Social Service Contract Between The Town Of Jackson And Jackson Hole Public Art for fiscal year 2026 ("First Amendment") is made and entered into by and between the Town of Jackson, Wyoming, a municipal corporation, with an address of P.O. Box 1687 Jackson, Wyoming 83001 ("Town") and Jackson Hole Public Art, a Wyoming non-profit corporation, with an address of P.O Box 4413, Jackson, Wyoming 83001 ("JHPA"), and shall be effective as of July 2, 2025.

WHEREAS, on June 12, 2024, the parties entered into a Social Service Contract ("2025 Contract") for JHPA to provide Arts and Arts Education services to Town for Town's 2024-2025 fiscal year;

WHEREAS, the parties agreed to amend the 2025 Contract to expand the scope of JHPA's services to include the administration and oversight of a public art grant awarded to Town from the National Endowment for the Arts on July 10, 2024 ("Grant"). JHPA's responsibilities related to the Grant continued beyond the end of the 2025 Contract and will likely continue thru at least the end of Town's 2025- 2026 fiscal year;

WHEREAS, effective as of July 1, 2025, the parties entered into a Social Service Contract ("2026 Contract") for JHPA to provide Arts and Arts Education services to Town for Town's 2025-2026 fiscal year;

WHEREAS, the parties have agreed to amend the 2026 Contract to include administration and oversight related to the Grant pursuant to the terms and conditions of this First Amendment as set forth herein.

NOW, THEREFORE, for good and valuable consideration, the sufficiency of which is acknowledged, the Parties agree as follows:

A. Exhibit A, JACKSON HOLE PUBLIC ART, Section "Description of Organization's Primary Programs, Activities, & Services," is hereby deleted and replaced in its entirety as follows:

Description of Organization's Primary Programs, Activities, & Services:

JHPA's core objectives are to commission art celebrating our environment and cultural heritage, facilitate partnerships to design engaging public spaces, provide opportunities for youth, emerging, and professional artists, increase access, understanding, and investment in public art. To achieve this we initiate, develop, and support environmental and cultural heritage art

installations, work with Jackson on civic and infrastructure enhancements, introduce public art in everyday spaces, and create and inspire community engagement and art-making opportunities. Our outcome measurements are aligned with each project's impact goals. Measurements used are numbers participating, numbers impacted, digital and personal surveys measuring personal, emotional, and behavior reactions and perception changes, and focus groups to identify public art projects that best meet needs and interests of the community.

In 2025-2026 JHPA will continue to administer and oversee the implementation of the National Endowment for the Arts Grant awarded to the Town of Jackson on July 10, 2024 to support the commissioning of public art for the Stilson Transit Center ("Grant"), including overseeing the administration and disbursement of the local matching funds appropriated to JHPA to be distributed in accordance with the Grant terms and conditions.

B. All other terms and conditions of the 2026 Contract, which are not in conflict with the terms and conditions of this First Amendment, shall remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have executed this First Amendment as of the date above.

JACKSON HOLE PUBLIC ART
A Wyoming Non-Profit Corporation

By: _____
Carrie Geraci, Executive Director

STATE OF WYOMING)
) ss.
COUNTY OF TETON)

Subscribed and sworn to before me this _____ day of _____, 2025 by Carrie Geraci, its Executive Director.

_____

Notary Public

My commission expires: _____

TOWN OF JACKSON

A Wyoming Municipal Corporation

By: _____

Arne O. Jorgensen, Mayor

ATTEST: _____

Riley Hovorka, Town Clerk

Zift

Merchant Application

WESTAMERICA BANK

Business Information

Partner: Civic Systems - Conv Fees Non Utility

Legal Business Name: Town of Jackson | **DBA Name:** Town of Jackson

Federal Tax ID: [redacted] | **Business Start Date:** 1914 | **Entity Type:** GA | **MCC:** 9399

Business Address: 150 E Pearl Ave / Jackson / WY / 83001

Contact Name: Arne Jorgenson | **Contact Phone:** 3077343482 | **Contact Email**: kthompson@jacksonwy.gov

Customer Service Phone Number: 3077333932 | **Website:** jacksonwy.gov

Annual CC Volume: $10000 | **Annual ACH Volume:** $2000

Average Transaction: $180 | **Highest Transaction:** $1000

Business Description: General Government Business License Renewal Applications

Banking Information

Bank Name: Bank of Jackson Hole | **Account Number:** [redacted] | **Routing Number:** [redacted]

AUTHORIZATION FOR AUTOMATIC FUNDS TRANSFER (ACH): The Merchant Bank is authorized to initiate or transmit automatic credit and/or debit and/or check entries to the account identified above and on the voided check supplied for this bank account This settlement account, defined above, will automatically be debited for all service amounts owed under this Merchant Agreement Said authorization is granted to the Merchant Bank's Processor and their agents The transit routing and account number entered above MUST have ACH debit and credit capability and must match the information listed on the voided check provided with this application

Bank Disclosure

Westamerica Bank | 3750 Westwind Blvd., Suite 210 | Santa Rosa, CA 95403 | (800) 939 9942 | acquirer@westamerica.com

Important Bank Responsibilities

1. A Visa member is the only entity approved to extend acceptance of Visa products directly to a merchant.
2. A Visa member must be a principal party to the merchant agreement.
3 The Visa member is responsible for, and must provide settlement funds to, the merchant
4 The Visa member is responsible for all funds held in reserve that are derived from settlement
5 The Visa member is responsible for educating merchants on pertinent Visa Rules with which merchants must comply.

Important Merchant Responsibilities

1. Ensure compliance with cardholder data security and storage requirements.
2. Maintain fraud and chargebacks below thresholds.
3. Review and understand the terms of the merchant agreement.
4 Comply with Visa Rules

The responsibilities listed above do not supersede terms of the merchant agreement and are provided to ensure the merchant understands important obligations of each party and that the Visa Member, Westamerica Bank, is the ultimate authority should the merchant have any problems

Beneficial Ownership Certification

Federal regulation requires us to obtain and verify information about the beneficial owners of your business.

Legal Entity Information

Legal Business Name: Town of Jackson | **Entity Type:** GA

Physical Street Address: 150 E Pearl Ave / Jackson / WY / 83001

Beneficial Ownership Information

A beneficial owner is anyone who directly or indirectly, through any contract, arrangement, understanding, relationship or otherwise, owns 25% or more of the equity interest of the legal entity listed on this form.

If no individual meets this definition then an individual with significant control of the legal entity must fill out the Managing Responsibility section.

Owner 1 Info

Name: | **Owner DOB:** | **Owner SSN:** | **Ownership Percentage:** %

Owner Address: / / /

Government Issued ID#: Third Party Verification In File | **State Country of Issuance:** Third Party Verification In File

Owner 2 Info

Name: | **Owner DOB:** | **Owner SSN:** | **Ownership Percentage:** %

Owner Address: / / /

Government Issued ID#: Third Party Verification In File | **State Country of Issuance:** Third Party Verification In File

Owner 3 Info

Name: | **Owner DOB:** | **Owner SSN:** | **Ownership Percentage:** %

Owner Address: / / /

Government Issued ID#: Third Party Verification In File | **State Country of Issuance:** Third Party Verification In File

Owner 4 Info

Name: | **Owner DOB:** | **Owner SSN:** | **Ownership Percentage:** %

Owner Address: / / /

Government Issued ID#: Third Party Verification In File | **State Country of Issuance:** Third Party Verification In File

Managing Officer Responsibility - Control Person

Provide information below for one individual with significant responsibility for managing the legal entity listed on this form, such as, an executive officer or senior manager (e.g. Chief Executive Officer, Chief Financial Officer, Chief Operating Officer, Managing Member, General Partner, President, Vice President, Treasurer); or Any other individual who regularly performs similar functions. If appropriate, an individual listed above in Beneficial Ownership Information may be listed in this section.

Name: Arne Jorgenson | **Officer DOB:** [redacted] | **Officer SSN:** [redacted] | **Officer Title:** Chairman

Officer Home Address: EXEMPT / EXEMPT / EXEMPT / EXEMPT | **Officer Email:** kthompson@jacksonwy.gov | **Officer Phone:** 3077343482

Government Issued ID#: Exempt or Third Party Verification In File | **State Country of Issuance:** Exempt or Third Party Verification In File

Attestation

I, **Arne Jorgenson** , hereby certify, to the best of my knowledge, that the beneficial ownership information provided below is complete and correct for all accounts. It is further agreed that Zift and Westamerica Bank will be immediately notified by the legal entity of any change in such information provided on this form.

Pricing Schedule

By processing payments with Zift, you agree to the fees and pricing terms either: (a) presented directly by Zift and listed below, (b) in a separate Pricing Agreement - Addendum, or (c) as disclosed and agreed to via the software platform through which your payment services are accessed. You acknowledge and authorize such pricing, and understand that the platform may facilitate pricing arrangements on your behalf as part of its integrated service.

Visa (sale): 2.90 % + $0.30 per transaction | **Visa (credit/refund):** 0.00 % + $0.00 per transaction

MasterCard (sale): 2.90 % + $0.30 per transaction | **MasterCard (credit/refund):** 0.00 % + $0.00 per transaction

Discover (sale): 2.90 % + $ 0.30 per transaction | **Discover (credit/refund):** 0.00 % + $ 0.00 per transaction

Amex (sale): 2.90 % + $ 0.30 per transaction | **Amex (credit/refund):** 0.00 % + $ 0.00 per transaction

ACH (sale): 0.00 % + $1.00 per transaction | **ACH (credit/refund):** 0.00 % + $0.00 per transaction

Per Chargeback: $15.00 | **Per ACH Return:** $2.50 | **Per Unauthorized ACH Return:** $15.00

Per Declined Transaction: $0.00 | **Per Batch Fee:** $0.00 | **Per Deposit Settlement Fee:** $0.00

Monthly PCI Validation Fee: $0.00

Monthly Service Fee: $0.00

Monthly Gateway Fee: $0.00

Monthly ACH Service Fee: $0.00

Monthly PCI Non-Compliance Fee: $0.00

Annual Fee: $0.00

One Time Setup Fee: $0.00

DISCLOSURE OF CARD ASSOCIATION PASS-THROUGH FEES

Each card organization (Visa, MasterCard, Discover, American Express), Voyager, Wright Express, and PIN Debit Networks assess fees to merchants in connection with transactions outside of the bank's control, such as dues and assessments, fixed acquirer network fees, international/cross-border transaction fees, network access and data usage charges. These fees apply to all merchants based in the United States, regardless of bank, processor or ISO affiliation and are passed through at cost to you, the merchant, and are not marked up. Should you have any questions about these pass through fees and how they appear on your monthly statement, please contact the customer service number on your monthly statement. By signing this application, you accept and agree to these pass through fees, should they apply to you, based on your Pricing Schedule, and understand that they may change from time to time without notice.

MERCHANT ACKNOWLEDGEMENTS, WARRANTIES, ACCEPTANCE

Merchant acknowledges that Zift (ISO) will determine all rates, fees and charges. Merchant agrees to the fees and pricing terms either: (a) presented directly by Zift, (b) in a separate Pricing Agreement - Addendum, or (c) as disclosed and agreed to via the software platform through which Merchants payment services are accessed. You acknowledge and authorize such pricing, and understand that the platform may facilitate pricing arrangements on your behalf as part of its integrated service. Merchant warrants that the information provided on this Merchant Application is true and correct and that ISO is relying on such information in its approval process and in setting the applicable discount rate, approved average ticket, and approved monthly volume. By signing the acceptance section below, Merchant principal(s) give(s) consent for ISO and/or Westamerica Bank (Bank) to obtain credit bureau report(s) on principal(s) and any other reports/inquiries ISO or Bank deem necessary to comply with the Customer Identification Program and Anti Money Laundering sections of the Bank Secrecy Act of 1970 and the USA PATRIOT Act of 2001 and any other applicable law(s). Merchant understands that the Merchant Processing Agreement, consisting of this Merchant Application and the accompanying Terms & Conditions, shall not take effect until Merchant has been approved by ISO and Bank and a Merchant Number is issued.

By signing below, or actively clicking to agree online, Merchant acknowledges to have received a copy of, and have read and understood the Terms & Conditions (which, together with this Merchant Application, is collectively referred to as the “Merchant Processing Agreement”) all of which is incorporated herein and deemed a part hereof by reference, and Merchant unconditionally agrees to be bound by the Terms & Conditions which can be found at zift.io/legal.

By signing below, or actively clicking to agree online, each Merchant principal agrees and affirms to be authorized as an officer, partner, manager or owner to submit this Merchant Application and to bind the Applicant to the aforementioned Merchant Processing Agreement and that a faxed, copied, scanned signature, or clicking to agree online, will be considered an original and legally valid.

By signing below, or actively clicking to agree online, Merchant agrees that Bank may run credit periodically, as required, to maintain the merchant account. Failure to provide an accurate Tax Filing Name or Federal Tax ID may result in a withholding of merchant funding per IRS regulations (See Terms and Conditions, Section 7.2(q) for further information). If your application is denied, you have a right to a written statement of the specific reason for the denial. To obtain the statement, please contact: Zift at underwriting@zift.io or Westamerica Bank, 3750 Westwind Blvd Ste. 210, Santa Rosa Ca 95403 within 60 days from the date you are notified of our decision. We will send you a written statement of reason for the denial with 30 days of receiving your request for the statement.

The attached terms and conditions apply to MERCHANT’s participation in the AMERICAN EXPRESS OptBlue® Program (“AMERICAN EXPRESS CARD ACCEPTANCE”): The American Express Merchant Operating Guide (“MOG”) sets forth the policies and procedures governing Merchant’s acceptance of the American Express Card. It is a part of, and is hereby incorporated by reference into, the Agreement. MERCHANT agrees to be bound by and accept all provisions in the MOG (as changed from time to time) as if fully set out in the Agreement and as a condition of MERCHANT’s agreement to accept the Card. MERCHANTS may obtain the latest version of the MOG by visiting www.americanexpress.com/merchantopguide or by contacting BANK.

The indicated principal(s) identified in numbers 1 and/or 2 below have the authorization to execute the Merchant Processing Agreement on behalf of the here within named business.

THE UNDERSIGNED ACCEPT THE MERCHANT ACKNOWLEDGEMENTS AND WARRANTIES AND THE ACCOMPANYING TERMS AND CONDITIONS THAT COLLECTIVELY CONSTITUTE THE MERCHANT PROCESSING AGREEMENT:

Signer Name Acknowledgement: Arne Jorgenson

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Regular - Consent
Submitting Department:	Public Works	**Presenter:**	Johnny Ziem
Agenda Item:	To Award Bid #26-03 for the Procurement of a New Electric Truck	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is to award Bid #26-03 for the purchase of a new electric (EV) truck for the Engineering Division within the Public Works Department.

Requested Action.
To award Bid #26-03 for the purchase of a new electric truck for the Engineering Division within the Public Works Department.

Recommendations.
Staff recommend the Council approve the procurement of a new electric truck for the Engineering Division within the Public Works Department.

Background.
The Public Works Department administers the bidding and purchasing of all new vehicles for the Town of Jackson.

Analysis.
When tasked with the purchase of any new vehicle, Public Works will work directly with each submitting department to consider current and future vehicle needs, potential vehicle types, and how each vehicle will be used to provide public service. This information is important because each department has been challenged to look for efficiency gains when making new vehicle purchases (when possible).

This vehicle will be purchased for and used by the Engineering Division. This division is responsible for providing implementation of the Public Works Capital Improvement Plan, issuing permits, and managing the Town's infrastructure. The Public Works Department recommends purchasing this vehicle because it will be replacing the Town's first-ever purchased electric GEM utility vehicle, which was purchased in 2016.

Possible Alternatives.
Possible alternatives for this item include:
1. Not approving and awarding Bid #26-03
2. Other

Comprehensive Plan & Priority Alignment.
- Chapter 2: Climate Sustainability
  - Principle 2.3 – Reduce greenhouse gas emissions through transportation
- Chapter 8: Quality Community Service Provision
  - Principle 8.1 – Maintain current, coordinated service delivery

Fiscal Impact.
We received one bid which is listed below. The one bid was from Fremont Motors of Lander, Wyoming, for $59,349 after trade-in. For the FY26 Budget, we show a budget of $62,500 for the purchase of a new electric truck.

Vendor	Vehicle Type	Unit Cost	Trade-in Value	Final Cost
Fremont Motors	Ford Lightening EV Truck	$ 61,149.00	$ 1,800.00	$ 59,349.00

Staff Impact.
Public Works staff will be impacted in additional labor hours, which are estimated to be 10 hours to prepare the new truck for use by the Engineering Division.

Attachments or Links.

- Bid #26-03 results

Suggested Motion.

I move to approve Bid #26-03 for the purchase of a new electric truck and award the bid to Fremont Motors of Lander, Wyoming, in the amount of $59,349.

BID NUMBER: 26-03 PROJECT NAME: One Electric Pick-Up

OPENING DATE & TIME: Sep. 5 @ 3:05pm OPENED BY:

	Name of Bidding Agency & City	Proof of WY Residency	Number of Addendums Acknowledged	Bid Bond / Check		Bid Amount	Returned Bid Bond / Check
1	Fremont Motors	✓		NO		BT $61,149 AT $59,349	
2							
3							
4							
5							
6							

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Regular - Consent
Submitting Department:	Public Works	**Presenter:**	Johnny Ziem
Agenda Item:	To Award Bid #26-04 for the Procurement of Four New Police Patrol Vehicles	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is the Council to award Bid #26-04 for the purchase of four new Patrol Division vehicles within the Police Department.

Requested Action.
To award Bid #26-04 for the purchase of four new Patrol Division vehicles within the Police Department.

Recommendations.
Staff recommend the Council approve the procurement of four new Patrol Division vehicles within the Police Department.

Background.
The Public Works Department administers the bidding and purchasing of all new vehicles for the Town of Jackson.

Analysis.
When tasked with the purchase of any new vehicle, Public Works will work directly with each submitting department to consider current and future vehicle needs, potential vehicle types, and how each vehicle will be used to provide public service. This information is important because each department has been challenged to look for efficiency gains when making new vehicle purchases (when possible).

This vehicle will be purchased for and used by the Patrol Division of the Police Department. This division is responsible for providing community policing and problem solving, they endeavor to maintain a safe and peaceful environment in which people can live, work, and play. The Police Department uses specific, police designed, all-wheel drive vehicles for higher wheel clearance for snow, all-wheel drive capability, and additional room for extra equipment and police required hardware.

Possible Alternatives.
Possible alternatives for this item include:
1. Not approving and awarding Bid #26-04
2. Other

Comprehensive Plan & Priority Alignment.
- Chapter 2: Climate Sustainability
  - Principle 2.3 – Reduce greenhouse gas emissions through transportation
- Chapter 8: Quality Community Service Provision
  - Principle 8.1 – Maintain current, coordinated service delivery

Fiscal Impact.
We received four bids which are listed below. The lowest bid was from Sheridan Motors of Sheridan, Wyoming, for $152,478. For the FY26 Budget, we show a budget of $276,000 for the purchase and build-out of four new Patrol Division vehicles.

Vendor	Vehicle Type	Unit Cost	Trade-in Value	Final Cost
Freemont Motors	Patrol SUV	$ 41,295.00	$ 6,650.00	$158,530.00
Sheridan Motors	**Patrol SUV**	**$ 40,507.00**	**$ 9,550.00**	**$152,478.00**
Youg Auto	Patrol SUV	$ 39,500.00	$ 2,000.00	$156,000.00
United Fleet Service	Patrol SUV	$ 45,793.77	$ 6,650.00	$176,525.08

Staff Impact.
Public Works staff will be impacted in additional labor hours, which are estimated to be 400 hours to build-out the new patrol vehicles.

Attachments or Links.
- Bid #26-04 results

Suggested Motion.

I move to approve Bid #26-04 for the purchase of four new Police Department Patrol vehicles and award the bid to Sheridan Motors of Sheridan, Wyoming, in the amount of $152,478.

BID NUMBER: 26-04 PROJECT NAME: Four AWD SUVs

OPENING DATE & TIME: Sep. 5 @ 3:05pm OPENED BY:

	Name of Bidding Agency & City	Proof of WY Residency	Number of Addendums Acknowledged	Bid Bond / Check		Bid Amount	Returned Bid Bond / Check
1	Freemont Motors	✓		NO	Durango	BT $165,180 AT 158,530	
2	Sheridan Motors	✓		Yes	Durango	BT $162,028 AT $152,478	
3	Young Auto	X			Durango	BT $158,000 AT $156,000	
4	United Fleet Services	X			Durango	BT $183,175.08 AT $176,525.08	
5							
6							

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Town Council Regular Mtg
Submitting Department:	Administration	**Presenter:**	Roxanne Robinson
Agenda Item:	2025 Rodeo End of Season Report and 2026 Rodeo Dates	**Public Comment:**	Yes - Consent

Purpose & Policy Considerations.
The purpose of this item is for the Town Council to approve the 2026 rodeo dates and consider the 2025 Rodeo Report, pursuant to the Rodeo Concession Agreement.

Requested Action.
The requested action is to receive Council approval for the 2026 rodeo dates as presented by JH Rodeo and consider the 2025 Rodeo Report as presented.

Recommendations.
Staff recommends approval of the 2026 rodeo dates and that Council consider the 2025 Rodeo Report as presented.

Background.
Rodeo Dates
The Rodeo Concession Agreement states that the rodeo shall be produced Wednesdays and Saturdays during the Rodeo Season. The Rodeo Season is the Friday of Memorial Day Weekend through the day after Labor Day. The rodeo shall also be produced on July 4th. The Rodeo Concession Agreement requires the next year's schedule to be submitted by September 25 and Council's action on the proposed schedule by October 31.

In addition to the rodeos discussed above, the Rodeo Concession Agreement allows two types of additional rodeos:

A. Mutual Agreement of Teton County and JH Rodeo: Teton County and JH Rodeo may agree to up to a maximum of eight additional rodeos to be produced during the Rodeo Season, with the approval of the Town Council. Eight additional dates have been requested and are included in the proposal attached to this staff report. The eight additional dates are each of the Fridays in July and August, with the exception of Fair Week.
B. Non-Regular Rodeos: The Rodeo Concession Agreement also allows the concessionaire to produce additional non-regular rodeos on dates that are approved by Teton County and the Town Council, so long as the rodeo facilities are not being used by third parties. The Rodeo Concession Agreement also notes that approval for these non-regular rodeos is not to be unreasonably withheld. Teton County, because they are the Administrative Authority, is able to charge a fee for this additional non-regular rodeo. This year's proposal includes a request for a ninth additional date – Friday, September 4, 2026. Historically, beginning in July and running through the end of the rodeo season, the concessionaire has received approval to conduct eight additional rodeos by mutual agreement on Fridays , except during the week of the Teton County Fair. Because Labor Day falls on September 7 in 2026, there are regular rodeos on Wednesday, September 2 and Saturday, September 5. The requested rodeo date of Friday, September 4, 2026 would fall within their historical schedule, but, technically because of this calendar issue, is a ninth additional date.

Teton County and the Fairgrounds Manager have approved of the proposed dates by the concessionaire, including the additional date of September 4, 2026. The Rodeo Concession Agreement also contains a provision that allows the Town Council to remove one Wednesday or one Saturday rodeo from the regular rodeo schedule. This provision to remove a rodeo was originally in the agreement to accommodate the World Series of Roping competition which is no longer held in Jackson.

The proposed 2026 rodeo dates are attached for Council review. The requested eight additional dates, that are set by mutual agreement, are Fridays during July and August, and the requested non-regular rodeo date is September 4, 2025.

Rodeo Report

The Rodeo Concession Agreement states the following regarding the annual report:

> *Not later than September 9 of each year of the term hereof, the Concessionaire and the Administrative Authority shall meet to discuss the previous season's rodeo operations, jointly prepare and jointly execute a report for submission to the Town Council, and if necessary, to recommend amendments to this Agreement for the benefit of: (a) the attending public; (b) the Town of Jackson; (c) the Administrative Authority and rodeo contestants. The executed report and any such recommendations of the Concessionaire and Administrative Authority shall be promptly delivered to the Town Council for its consideration not later than September 25 of each year. Priority of consideration shall be given by the Town to those recommendations which are jointly endorsed by the Concessionaire and the Administrative Authority, the intent of this provision being the harmonious operation of a rodeo concession for the benefit of the community and the parties hereto.*

As noted, the concessionaire is JH Rodeo, and the Administrative Authority is Teton County. The end of season report is attached to the staff report and staff are happy to report that this rodeo season was reported as successful and well-coordinated. The Fair and Fairgrounds Manager reported that the concessionaire maintained open communication with Fairgrounds staff and vacated the premises in good condition prior to Fair Week. The working relationship between JH Rodeo and Teton County Fairgrounds staff continues to be productive.

The main points of that report include:

- Attendance and Financial Summary.
- Maintenance and Facility Use.
- Capital Improvement Recommendations proposed for future Capital Improvement Program consideration:
    - Arena Ground Material Replacement
    - Roping Chute Replacement
    - Seating Expansion
    - Larger Toilet Paper Roll Holders in Restrooms Located Underneath Grandstands

The Rodeo Concession Agreement additionally provides that JH Rodeo and Teton County have the ability to recommend amendments to the Rodeo Concession Agreement if they feel necessary, however, the 2025 end-of-season report has no such recommendations for Council to act on.

Analysis.

Key Question #1 – Does Council approve of the 2026 rodeo dates as requested?

As noted, the Concessionaire has requested the attached dates, and Teton County approves of the requested dates.

With respect to the additional (9) requested dates, the Town Council may want to consider impacts to the surrounding neighborhood as a result of the additional rodeos.

Possible Alternatives.

Rodeo Dates

Alternatives for the Council with respect to the 2026 rodeo dates include:

1) Remove one Wednesday or Saturday night rodeo, and/or
2) Denial of the eight additional rodeo event dates requested, and/or

3) Denial of the additional 9th non-regular rodeo on September 4, 2026.

Rodeo Report
Alternatives with respect to the 2025 end-of-season report include:

1) Council discussing and/or directing staff to negotiate amendments to the Rodeo Concession Agreement.

Comprehensive Plan & Priority Alignment.

The production of a rodeo relates to Common Value 3, Quality of Life, in that rodeos in Jackson are a part of our history and culture. They also pay homage to our ranching heritage. Rodeos also allow locals who work at dude and working ranches to participate in a local activity, while providing entertainment to tourists, and therefore supporting our economy on multiple levels.

Fiscal Impact.

There is no fiscal impact associated with approval of the proposed 2026 rodeo dates. The rodeo concessionaire is required to pay $50,000 or 10% of gross receipts, whichever is greater, for use of the grounds for each rodeo season. JH Rodeo has made their 3 required payments of $12,500 with the remaining payment due on October 15, 2025 (10% of proceeds).

Pursuant to the Teton County Fairgrounds Lease Agreement (TCFLA) between the Town of Jackson and Teton County, Teton County pays the Town of Jackson $100 per year to lease a portion of the rodeo grounds from the Town of Jackson. Pursuant to the Rodeo Grounds Management Agreement (RGMA) between the Town and the County, the Town passes through a minimum of $10,000 and a maximum of $80,000 (at no time exceeding the amount received from the Concessionaire) to Teton County for management of the grounds on our behalf. This pass through of funds usually occurs in the spring following the previous season.

Staff Impact.

The Director of Internal Services spent approximately 4 hours gathering information and preparing/editing the staff report. Additionally, the Town Manager and Town Attorney spent a combined 2 hours reviewing the staff report.

Attachments or Links.

2026 Proposed Rodeo Dates
2025 End of Season Report

Suggested Motion.

Item 1
I move to approve the 2026 rodeo schedule as presented.

Item 2
If Council is inclined to direct staff to amend the Rodeo Concession Agreement, an appropriate motion is:

I move to direct staff to draft and negotiate amendments to the Rodeo Concession Agreement as follows:

a. _____;
b. _____; and
c. _____ (etc.)

2026 Proposed Rodeo Schedule

May

Sun	Mon	Tue	Wed	Thu	Fri	Sat
17	18	19	20	21	22	23 **RDOEO**
24/31	25	26	27 **RDOEO**	28	29	30 **RDOEO**

JUNE

	1	2	3 **RDOEO**	4	5	6 **RDOEO**
7	8	9	10 **RDOEO**	11	12	13 **RDOEO**
14	15	16	17 **RDOEO**	18	19	20 **RDOEO**
21/28	22/29	23/30	24 **RODEO**	25	26	27 **RODEO**

JULY

			1 **RODEO**	2	3 **RODEO**	4 **RODEO**
5	6	7	8 **RODEO**	9	10 **RODEO**	11 **RODEO**
12	13	14	15 **RODEO**	16	17 **RODEO**	18 **RODEO**
19	20	21	22 **FAIR**	23	24	25
26	27	28	29 **RODEO**	30	31 **RODEO**	

AUGUST

						1 **RODEO**
2	3	4	5 **RODEO**	6	7 **RODEO**	8 **RODEO**
9	10	11	12 **RODEO**	13	14 **RODEO**	15 **RODEO**
16	17	18	19 **RODEO**	20	21 **RODEO**	22 **RODEO**
23/30	24/31	25	26 **RODEO**	27	28 **RODEO**	29 **RODEO**

SEPTEMBER

		1	2 **RODEO**	3	4 **RODEO**	5 **RODEO**

Prepared Jointly by:

- Trista Hiltbrunner, Fair & Fairgrounds Manager
- brandon Wilson, WW Productions, Rodeo Concessionaire

Date: September 18, 2025

1. Overview of 2025 Rodeo Season

The 2025 Jackson Hole Rodeo season was successful and well-coordinated between the Rodeo Concessionaire and the Administrative Authority. The Concessionaire maintained open communication with Fairgrounds staff and vacated the premises in good condition prior to Fair Week.

2. Attendance and Financial Summary

Per Section 5 of the Concession Agreement, the following data was submitted monthly using Exhibit B:

- **Total Number of Rodeo Events Held:** [38] (Includes Shriner's Rodeos)
- **Total Number of Tickets Sold:** [~ 69,302]
- **Ticket Sales:** [~ $3,323,511]
- **Beer Sales:** [~ $349,292.66]
- **Merchandise Sales:** [~ $156,244.19]
- **Food Sales:** [~ $444,304.39]
- **Concession Fee Paid to Town:** $[~ 397,421.46]

*All numbers are based on the JHR totals emailed monthly by Jackson Hole Rodeo to the Administrative Authority.

3. Maintenance and Facility Use

The Concessionaire fulfilled its responsibilities for routine maintenance, including:

- Arena and chute upkeep:
- Bleacher and restroom cleaning:
- Trash and recycling removal:
- Sound system compliance:
- First aid/EMT presence at all events:

Joint Walkthroughs Conducted:

- Pre-season: [Yes, 5/21/25]
- Post-season: [Yes, 9/10/25]

4. Capital Improvement Recommendations

The following items are proposed for future CIP consideration:

- **Arena Ground Material Replacement**
  - Estimated Cost: $150,000
  - Justification: Safety and footing improvement
  - Funding Source: County
- **Roping Chute Replacement**
  - Estimated Cost: $4,000
  - Description- The roping chute has aged and needs to be replaced. Due to constant use throughout the summer and exposure to outside weather conditions, the floor and panels have rusted, posing a safety concern for livestock.
- **Seating Expansion (5,000 seats)**
  - Status: Exploratory
  - Cost Estimate: TBD
  - Requires a structural and cost feasibility study
- **Larger Toilet Paper Roll Holders in Bathrooms located underneath the Grandstands**
  - Status: Exploratory
  - Cost Estimate: TBD
  - Description- The concessionaire has to replace toilet paper halfway through the rodeos because the holders are too small for the number of restroom users.

5. 2026 Rodeo Schedule Submission

The proposed 2026 Rodeo Schedule was submitted to the Town Council on 9/26/25 and includes:

- See Appendix A
- Events on all required Wednesdays, Saturdays, and Fridays starting July 4
- Additional date Wednesday, September 2nd pending Town Council approval
- Fair Week blackout observed (July 22–27, 2026)

The Administrative Authority is in favor of the proposed 2026 JH Rodeo dates and looks forward to another successful season!

6. Compliance and Communication

- All required reports and payments were submitted on time: Yes

- No material breaches of the Concession Agreement occurred: No breaches
- Disputes or issues requiring Town Council intervention: None
- Concessionaire contact and insurance documentation updated: Yes

7. Signatures

Trista Hiltbrunner
Fair & Fairgrounds Manager
Date: _____

Brandon **Wilson**
WW Productions, Rodeo Concessionaire
Date: 10/7/25

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Town Council Regular Mtg
Submitting Department:	Internal Services	**Presenter:**	Roxanne Robinson
Agenda Item:	Potential Reconsideration of Millward/Simpson Garage Overnight Pricing	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is to provide the Council information and options with respect to the reconsideration of the Millward/Simpson Garage Overnight Pricing item discussed and voted on at the October 6, 2025 Council Workshop.

Requested Action.
Staff requests the Council 1) reconsider the October 6, 2025 vote on the Millward/Simpson Garage Overnight Pricing item, and, if reconsideration is successful, 2) request the motion maker withdraw their motion, the seconder consent to withdrawal, and finally a motion to continue the item to the November 3, 2025 Regular Town Council Meeting be proposed.

Recommendations.
Staff recommends the Millward/Simpson Garage Overnight Pricing item be presented anew at the November 3, 2025 Regular Town Council Meeting.

Background.
At the October 6, 2025 Regular Town Council Workshop the Town Council voted to "to direct staff to implement a payment structure for car storage at the Town Parking Garage with first 8 hours free, then $5 dollars per hour, up to a maximum daily rate of $25 and direct staff to complete a survey of Jackson Street Apartments to determine additional parking needs of residents including the number of additional parking spaces and what level of pricing is attainable." That motion passed 5-0 with all in favor. Some Councilors have since indicated a desire to reconsider the vote on that motion, withdraw the motion, and continue the item to the November 3, 2025 Regular Town Council Meeting, resulting in this staff report.

Analysis.
Reconsideration Generally
In general, the reconsideration process allows the Council to re-vote on a previously adopted motion during the same meeting, or at a future meeting before the minutes, including the previously adopted motion, are approved. To begin the process, a Councilor who voted on the prevailing side must make the motion to reconsider, which another Councilor must second. If the motion for reconsideration is approved, the original motion is brought back for a new vote as if it had never been voted on.

Therefore, this process has two steps: The motion to reconsider is made, discussed, debated, and voted on and, *if the motion to reconsider is successful*, then a second step is undertaken – namely, the Council dealing with the original motion before as if it had never been voted on. If the motion to reconsider fails, the original motion and action pursuant to it endures.

The Basis for Reconsideration
The Council's Rules and Procedures permit motions to reconsider to
1) permit the correction of hasty, ill-advised, or erroneous action;
2) take into account added information; or
3) address a changed situation that has developed since the vote was taken.

Who May Make a motion for Reconsideration
A Motion to Reconsider can only be made by a Councilor that voted on the prevailing side – i.e., a Councilor that voted "yes" on a motion that passed or voted "no" on a motion that failed – and only before the minutes have been approved.

What is the Procedure for Reconsideration
The Councilor making the reconsideration motion will make a statement identifying one or more of these reasons for making the motion to reconsider as set forth in the script attached to this staff report. Given that reconsideration is not a frequent occurrence for the Council and it is a detailed process, the script sets forth the step-by-step actions, including when motions are made, when debate occurs, when votes are taken, and options for Council consideration. Options for consideration are also listed below under possible alternatives.

Recognizing the investment made by members of the public to attend, listen to the presentation, participate, and hear the outcome of a vote on a specific item, if a motion to reconsider is made and approved, staff recommends the original motion from October 6, 2025 be withdrawn and the Millward/Simpson Garage Overnight Pricing item be continued and fully considered at a future meeting where the public has advance notice to again engage in local government decisions. In this case, that future meeting would be the November 3, 2025 Regular Town Council Meeting. These actions allow additional information to be fully prepared, preparation for dialogue on the topic to be thought out, and any alternatives to be considered.

Staff also researched the notation in the minutes and approval of the minutes after a reconsideration occurs. For this reconsideration and any moving forward, regardless of whether a motion to reconsider is successful, staff will defer approval of the minutes from the meeting where the original motion was made to a future date to allow inclusion of appropriate notation in the minutes. The minutes of the October 6, 2025 Town Council meeting will be presented for approval at the November 3, 2025 Town Council meeting.

Key Question #1.
Does Council wish to reconsider their vote on the payment structure for car storage at the Town Parking Garage?

If the answer is yes, staff recommends Council follow the script attached to this staff report and, if the motion to reconsider passes, that Council withdraw the motion of the payment structure for car storage at the Town Parking Garage, and continue the item to the November 3, 2025 regular Town Council meeting.

Possible Alternatives.

As set forth above, reconsideration is a two-step process, thus:

First, with respect to reconsideration, once the motion to reconsider has been made and seconded, the Council has two options:

1. Debate and act on the motion to reconsider at this meeting(*Staff's recommended action*), or
2. Delay debate and action on the motion to reconsider to a future meeting.

Second, with respect to the original motion (if reconsideration is successful), alternatives for Council are:

A. The original motion maker (Councilor Schechter) withdraws the motion, the seconder (Councilor Viehman) concurs with withdrawal, and the Millward/Simpson Garage Overnight Pricing item is continued to the November 3, 2025 Town Council Meeting (*Staff's recommended action and set forth in the attached script).*
B. The original motion is voted on.

Comprehensive Plan & Priority Alignment.

Reconsideration is an allowed action by the Town Council to rethink a previous decision that may not be the best way to provide quality community service provision as set forth in Section 8, support multimodal transportation as set forth in

Section 7, or support local workforce housing as set forth in Section 5. Reconsideration allows the Town Council to fully consider whether their previous action was the most effective way to support the principles in the Comprehensive Plan.

Fiscal Impact.
There is no direct fiscal impact for reconsidering the vote on the motion for a payment structure for car storage at the Town Parking Garage. Should a different payment structure be ultimately decided upon, that may have a fiscal impact.

Staff Impact.
The staff impact of preparing this reconsideration staff report and supporting script for the Council is approximately 10 hours of time in the Internal Services, Administration, and Legal Departments.

Attachments or Links.
Reconsideration Script.

Suggested Motion.
The suggested motions are set forth in the reconsideration script attached to this staff report.

COUNCIL SCRIPT FOR RECONSIDERATION

PART 1: Council Reconsideration of the Item

Robert's Rules of Order states that the purpose of reconsidering a vote is to permit correction of hasty, ill-advised, or erroneous action, or to take into account added information or a changed situation that has developed since the taking of the vote.

Mayor: At the October 6, 2025 Regular Town Council Workshop the Town Council voted to "to direct staff to implement a payment structure for car storage at the Town Parking Garage with first 8 hours free, then $5 dollars per hour, up to a maximum daily rate of $25 and direct staff to complete a survey of Jackson Street Apartments to determine additional parking needs of residents including the number of additional parking spaces and what level of pricing is attainable." That motion passed 5-0 with all in favor. Some Councilors have indicated a desire to reconsider the vote on that motion and take action on that reconsideration today. Any Councilor who voted on the prevailing side, is able to make a motion to reconsider.

Any Councilor _____: I will be making a motion to reconsider the vote on a payment structure for car storage at the Town Parking Garage for future action. I am making this motion to . . . [*1) permit the correction of hasty, ill-advised, or erroneous action; 2) take into account added information; or 3) address a changed situation that has developed since the taking of the vote*]. I move to reconsider the vote on the motion to approve a payment structure for car storage at the Town Parking Garage that occurred on October 6, 2025.

Any Councilor: Second.

Mayor: It has been moved by _____ and seconded by _____ to reconsider the vote on the motion. At this time, I will call for any debate or Council discussion on whether to reconsider the vote to approve a payment structure for car storage at the Town Parking Garage that occurred on October 6, 2025.

Debate occurs. *Debate should focus on whether or not there is added information or a changed situation or if a Councilor felt they made an ill-advised, hasty, or erroneous action.*

Mayor: I will now call for the vote on whether to reconsider the vote from the October 6, 2025 meeting to approve a payment structure for car storage at the Town Parking Garage. All those in favor, signify by saying 'aye.'

If the reconsideration passes, then proceed. If the reconsideration does not pass, the Mayor announces that the motion to reconsider failed and that they will now move on with the regular meeting agenda.

PART 2: Council Direction Regarding the Original Motion

Mayor *(if the motion to reconsider passes)*: "The motion now before us is "to direct staff to implement a payment structure for car storage at the Town Parking Garage with first 8 hours free, then $5 dollars per hour, up to a maximum daily rate of $25 and direct staff to complete a survey of Jackson Street Apartments to determine additional parking needs of residents including the number of additional parking spaces and what level of pricing is attainable."

Staff recommend:

1) *The motion maker (Councilor Schechter) withdraws their motion by gaining the consent of the seconder (Councilor Viehman) and, subsequently a Councilor makes a motion to continue the item to November 3, 2025.*

Mayor: The motion has been withdrawn. I will entertain other motions.

Any Councilor: I move to continue the Millward/Simpson Garage Overnight Pricing item to the November 3, 2025 Regular Town Council Meeting.

Any Councilor: Second

Mayor: It has been moved by _____ and seconded by _____.

All those in favor, signify by saying 'aye.'

All opposed.

Motion . . . [*carries … fails …*].

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Regular
Submitting Department:	Administration	**Presenter:**	Tyler Sinclair
Agenda Item:	90 Virginian Lane	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is for the Town Council to consider how to divide the $10m committed in principle for the 90 Virginian Lane project between the Town and County and where the Town portion of this funding should come from. This is an informational item only with no formal action required.

Requested Action.
Staff request that the Town Council consider how to divide the $10m for the 90 Virginian Lane project between the Town and County and where the Town portion of this funding should come from.

Recommendations.
Staff recommend the Town Council consider dividing the $10m for the 90 Virginian Lane project 50%/50% between the Town and County and that the Town use Restricted and Assigned Housing Funds as proposed below.

Background.
In 2023, the Housing Authority purchased the land at 90 Virginian Lane for $28 million. This purchase was funded utilizing $18 million in tax-exempt bond financing (to be paid by with 2022 SPET funds) + $2.59 million 2019 SPET funding + $5.5 million County mitigation funding + $2 million Town housing funding (blend of mitigation fees and housing supply funds).

In December 2024, the County Commission and Town Council directed and authorized the Housing Authority to execute the 2025 Season Ground Lease for RV Park Operations with the Virginian RV Park LLC. The Ground Lease fee of $500,000 was paid to the Housing Authority and these funds have been placed in the Housing Authority's Housing Supply Fund.

In May 2025, the County Commission and Town Council directed and authorized the Housing Authority to enter into a cost-sharing agreement with Pennrose for schematic design not to exceed $250,000. The schematic design costs are being paid for from the Housing Authority's Housing Supply Fund.

Analysis & Key Policy Questions.
As part of the project the Town and County have agreed in principle to provide $10 million to further fund the project. This amount is in addition to the Town and County's contributions to purchase the land, which are listed above.

The first item to consider in this report is how the Town and County should divide the $10 million in additional funding for the project. Town staff are recommending that the Town and County split the $10m, 50%/50% or $5.0m each. Alternatives to the recommended 50%/50% split include: 1) by population (46%/54%) 2) by the current Town/County split in the Joint Funding MOU (43%/57%) or 3) by taking into consideration contributions already made by the Town and County.

Key Question 1: Does the Council agree that the Town and County split the $10m additional funding for the project, 50%/50% or $5.0m each?

The second item in this report is for the Town to discuss where the $5.0m Town portion for this project will be funded from (which Town account). Staff note that for this funding the Town will receive the creation of a minimum of 200 affordable/workforce housing units; the Town will not receive any first rights of purchase or lease. The identification of

sources for this funding is a preliminary step in the overall project financing discussion that will take place at a Joint Meeting in November. The purpose of this item is for the Town to begin to identify the source(s) for this funding from the Town to inform the discussion at the November Joint Meeting. It is anticipated that Teton County will consider a similar item prior to the November Joint Meeting. As stated above this is a preliminary step with final consideration of this request occurring when the Town and County consider approval of the Development Agreement and Financing Agreement for the project.

As of June 30, 2025, the Town has the following funding available in its Housing accounts:

- **$3,622,803 Assigned** – These funds have been assigned for use in providing affordable community housing but may be transferred back to the General Fund or to another fund
- **$1,618,923 Restricted** – These funds must be used of providing affordable community housing
- **$5,241,726 Total Funds**

Staff recommend that Council authorize the use of $1,618,923 (plus any additional funds received not to exceed $5M) in Restricted Funds and up to $3,381,077 in Assigned Housing Funds to meet the $5.0m contribution in principle for 90 Virginian Lane. Other alternative funds for Council consideration could include the General Fund, Town Employee Housing Fund, and others.

Key Question 2: Does the Council agree to use $1,618,923 923 (plus any additional funds received) in Restricted Housing funds and up to $3,381,077 in Assigned Housing Funds to meet the $5.0m contribution in principle for 90 Virginian Lane?

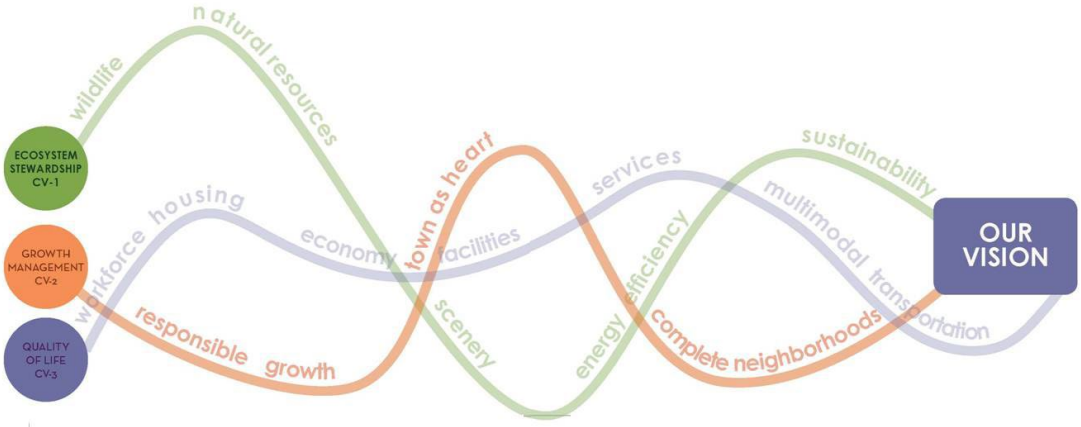
Possible Alternatives.

The Council has the option to:

1) Adjust the percentage of funding from Restricted and Assigned Housing Funds to meet the $5.0m contribution in principle for 90 Virginian Lane
2) Identify other sources of funding
3) Other

Comprehensive Plan & Priority Alignment.

The Jackson/Teton County Comprehensive Plan is predicated on three equally important Common Values for us to live within our shared community Vision: Ecosystem Stewardship, Growth Management, and Quality of Life. Just as the strength of a rope depends on the integrity of each intertwining thread, the strength of our community character is derived from a commitment to all three Common Values, each in support of and reliant upon the others.



Common Value: Quality of Life
The Comprehensive Plan sets a minimum goal of achieving a 65% resident workforce. Building on this goal, the Workforce Housing Action Plan set forth strategies for increasing our resident workforce that include location for growth, a focus on public-private partnerships, and updating land development regulations to incentivize affordable workforce housing development by the private sector.

The future neighborhood at 90 Virginian Lane is an example of a public-private partnership, leveraging private sector expertise, while mitigating public risk; and utilizes LDR incentives for affordable workforce housing development.

Common Value: Ecosystem Stewardship
The Comprehensive Plan also sets a goal to direct at least 60% of all new residential development into Complete Neighborhoods to preserve habitat, scenery, and open space and provide workforce housing opportunities. Since Housing Action Plan implementation and including changes to the Land Development Regulations that incentivize affordable workforce housing production in the Town of Jackson, the percentage of new development built in Complete Neighborhoods has exceeded the 60% minimum threshold. By placing development in the center of Town, the 90 Virginian Lane development accomplishes our goal of concentrating new development in Complete Neighborhoods.

The Comprehensive Plan sets a goal to emit less greenhouse gases ("GHG") than we did in 2012. Surface travel accounts for most of the GHG Emissions created locally. **By placing households close to their jobs, local convenience, recreational amenities, and providing them with opportunities to use alternative modes of transportation like the bus or biking, the 90 Virginian Lane development will positively impact GHG Emissions.**

Common Value: Growth Management
The Comprehensive Plan sets a cap on new residential units that can be built. We currently have about 550 pooled residential bonus units remaining to be assigned to future developments. **The 90 Virginian Lane Neighborhood accomplishes our Comprehensive Plan goals related to growth management by effectively using the remaining pooled units for 100% permanently deed restricted affordable workforce housing in a high-density residential zone located in a Transitional Subarea** (as opposed to using the units for unrestricted, free market homes located outside a Complete Neighborhood).

Fiscal Impact.
Please see discussion of Fiscal Impact in the Analysis section above.

Staff Impact.
Town staff have spent approximately 8 hours working on this item.

Attachments or Links.
None

Suggested Motion.
No Motion required.

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Regular
Submitting Department:	Administration	**Presenter:**	Tyler Sinclair
Agenda Item:	Municipal Court – Security Equipment and Associated Expenses	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is for the Town Council to consider purchasing security X-ray equipment and other associated expenses for the relocation of the Municipal Court to Town Hall.

Requested Action.
Staff requests the Town Council consider the purchase of the proposed equipment.

Recommendations.
Staff recommend the Town Council approve the purchase of the proposed equipment.

Background.
At the July 28, 2025, Regular Town Council meeting, Council approved a Sketch Plan for the Justice Center that included the Clifford P. Hansen Courthouse (Courthouse) remaining as part of the application. Teton County subsequently approved the demolition of the Courthouse as part of the Justice Center project, with demolition scheduled for January/February of 2026. Currently the Town Municipal Court and Victim Services operate out of this Courthouse. Both the Town Municipal Court and Victim Services will be accommodated in the new Justice Center. During construction of the new facility (2-3 years) Teton County will accommodate Victim Services in the basement of the County General Services building. The County does not have a temporary location for Town Municipal Court and thus the Town is preparing to relocate Municipal Court to the Town Hall Council Chambers beginning in the new year. Municipal Court typically occurs three (3) Wednesdays a month, and/or as otherwise needed for additional dates or jury trials.

Analysis & Key Policy Questions.
There will be impacts to Town Hall due to this relocation and necessary improvements to accommodate Municipal Court in the Council Chambers and Town Hall lobby. The primary impact to Town Hall will be additional use of the Council Chambers and Town Hall lobby for Court limiting its availability and functionality for other meetings/events. Town Hall and the Council Chambers are regularly utilized for Town and other community boards and functions.

Specifically, related to the use of the Council Chambers for Municipal Court, staff are recommending security upgrades to match those currently utilized, including an X-ray machine (for bags and coats), magnetometer (walk through) and metal detection wands and associated screening area in the Town Hall

lobby. This equipment and associated screening area will need to be set up on court days in the lobby of Town Hall. The proposed equipment is movable although not easily and will need to be stored when not in use. Staff have measured the space and are able to make it function, but it will impact the use of the Town Hall lobby and front desk areas on court days. The Town currently budgets for and provides two (2) court bailiffs to operate the X-ray machine and provide security during court proceedings. There would be no change in staffing as a result of locating Municipal Court in Council Chambers.

Holding Municipal Court in Council Chambers will not be ideal, with limited space to set up a typical court layout with adequate separation between the judge, attorneys, defendants and the public. In addition, there will be inadequate space for a judge's chambers, and attorney meeting rooms, during this temporary period. Other improvements recommended to accommodate the Municipal Court include replacement of the Council Chambers audience chairs and some tables with something smaller and more easily moved along with some partitions for separation in the Council Chambers and lobby area.

Below staff have provided a list of the recommended estimated purchase costs:

- X-ray machine – $36,390.00
- X-ray wands - $11,440.00
- Council Chamber chairs and tables, - $10,000.00
- Court room and lobby partitions - $5,000.00
- Approximate Total - $62,830.00

Due to the lead time to order and receive the recommended equipment (8-10 weeks) staff is recommending Council authorize purchase of this equipment now to ensure it is delivered and available by the new year. Staff have included a project not to exceed of $65,000 in the suggested motion, knowing that the above costs are estimates at this time. Staff have inquired whether the current x-ray and security equipment in the existing Courthouse could be purchased by the Town, and are awaiting a response. Should we be able to do so at a reduced expense staff would pursue that option.

Key Question 1: Does Council concur with the purchase of security equipment and other associated expenses in an amount not to exceed $65,000.00 for the relocation of Municipal Court to the Town Council Chambers?

Although staff recommends authorizing the Town to purchase this equipment, Council could consider whether they would like to request Teton County reimburse the Town for the items. At this time it is anticipated that the County will provide funding for making all necessary improvements for Victim Services in the County General Services Building while the Town would be responsible for all costs associated with locating Municipal Court in Town Hall.

Key Question 2: Does Town Council want to request reimbursement from Teton County for the cost of security equipment purchases necessary for relocating Municipal Court to Town Hall as a result of the current Courthouse being demolished?

Possible Alternatives.

The Council has the option to:

1) Modify the requested purchases
2) Not approve the requested purchases
3) Other

Comprehensive Plan & Priority Alignment.

This item aligns, generally, with the Comprehensive Plan by ensuring the general welfare, health, and safety of the community and its environment.

Fiscal Impact.
Funding for these requests was not included in the Fiscal Year 2026 budget. Approximately $62,830.00 would be added to the Town Hall facility budget from the General Fund in a future budget amendment resolution.

Staff Impact.
Town staff have spent approximately 30 hours working on the relocation of Victim Services and the Municipal Court as a result of the demolition of the current Courthouse.

Attachments or Links.

- Laurus Systems Quotations

Suggested Motions.

Item 1
I move to approve the purchase of security equipment and other associated expenses as described in this staff report dated October 20, 2025, in an amount not to exceed $65,000.00 for the relocation of Municipal Court to the Town Council Chambers.

Item 2
I move to direct staff to request Teton County reimburse the Town for the purchase of security equipment and other associated expenses as described in this October 20, 2025, staff report.

LAURUS Systems Inc.
3460 Ellicott Center Drive
Suite 101
Ellicott City, MD 21043-4164
USA
Voice: 410-465-5558 Fax: 410-465-5257

QUOTATION

Quote Number: Q25-30898
Quote Date: Oct 1, 2025
Page: 1

FEIN: 52-2326481
DUNS: 027861462
CAGE: 1UZ18

Certified Business Desginations: WOSB-WBE-DBE

To Place an order-please fax orders to 410-465-5257 or e-ma
Laurus.Orders@LaurusSystems.com

Quoted To:

Town of Jackson
150 E Pearl Avenue
PO Box 1687
Jackson, WY 83001
USA

Ship To:

Town of Jackson
Jackson, WY 83001
USA

Customer ID	Good Thru	Payment Terms	Sales Rep
WY_JACKSON	10/31/25	Net 30 Days	Bill Thieben

Quantity	Item	Description	Unit Price	Amount
1.00	918CX	Rapiscan 918CX X-Ray scanner - Multi Voltage-140KV	23,900.00	23,900.00
1.00	101038597	Software - Feature- 0.2M/S - 9XX - BPI		
1.00	101059024	KIT MONITOR 1920X1080 - 24-INCH - 9XX Commercial		
1.00	21110306	VOLTAGE KIT - DV - TYPE B - 115V - N.AMERICA/JAPAN 3-PIN		
1.00	101017475	Kit-SHROUD ASSEMBLY for the 918CX		
1.00	101025730	KIT, USB DONGLE, 9XX		
1.00	101021784	ASSY - Side Mount - 918CX - ORION		
2.00	101032987	Roller Bed with Pop-Up & Back Stop - Plastic - 1.0M - 918CX	595.00	1,190.00
1.00	Installation	Rapiscan Installation and Basic Operator Instruction. Additional Charges may result if site is not prepared per technical and environmental specifications .	2,000.00	2,000.00
1.00	Warranty-2	Warranty-1 year parts and labor from date of shipment		
1.00	TRAINING	Training Charges - Instructor-led on-site training, 4-6 hrs, max 10 students	5,000.00	5,000.00
1.00	SW930193	OPTIONAL - SOFTWARE-FEATURE-AUTOMATIC TARGET-BPI	350.00	350.00

Subtotal	Continued
Sales Tax	Continued
Freight	Continued
TOTAL	**Continued**

Sales Rep Email: bill.thieben@laurussystems.com

For up to date product information-news-manuals and support-Visit us on the Web at www.LaurusSystems.co

Freight Terms-FOB Origin (prepay and add)

BUDGETARY

LAURUS Systems Inc.
3460 Ellicott Center Drive
Suite 101
Ellicott City, MD 21043-4164
USA
Voice: 410-465-5558 Fax: 410-465-5257

QUOTATION

Quote Number: Q25-30898
Quote Date: Oct 1, 2025
Page: 2

FEIN: 52-2326481
DUNS: 027861462
CAGE: 1UZ18

Certified Business Desginations: WOSB-WBE-DBE

To Place an order-please fax orders to 410-465-5257 or e-ma
Laurus.Orders@LaurusSystems.com

Quoted To:

Town of Jackson
150 E Pearl Avenue
PO Box 1687
Jackson, WY 83001
USA

Ship To:

Town of Jackson
150 E Pearl Avenue
PO Box 1687
Jackson, WY 83001
USA

Customer ID	Good Thru	Payment Terms	Sales Rep
WY_JACKSON	10/31/25	Net 30 Days	Bill Thieben

Quantity	Item	Description	Unit Price	Amount
1.00	SW930194	OPTIONAL - Software - Feature - DTA - BPI	225.00	225.00
1.00	SW930240	OPTIONAL - Software-OTP-BPI-OP TRN SW-BPI LEAD TIME 8-10 WEEKS	225.00	225.00

Subtotal	32,890.00
Sales Tax	
Freight	3,500.00
TOTAL	**36,390.00**

Sales Rep Email: bill.thieben@laurussystems.com

For up to date product information-news-manuals and support-Visit us on the Web at www.LaurusSystems.co

Freight Terms-FOB Origin
(prepay and add)

BUDGETARY

LAURUS Systems Inc.
3460 Ellicott Center Drive
Suite 101
Ellicott City, MD 21043-4164
USA
Voice: 410-465-5558 Fax: 410-465-5257

QUOTATION

Quote Number: Q25-30899
Quote Date: Oct 1, 2025
Page: 1

FEIN: 52-2326481
DUNS: 027861462
CAGE: 1UZ18

Certified Business Desginations: WOSB-WBE-DBE

To Place an order-please fax orders to 410-465-5257 or e-ma
Laurus.Orders@LaurusSystems.com

Quoted To:

Town of Jackson
150 E Pearl Avenue
PO Box 1687
Jackson, WY 83001
USA

Ship To:

Town of Jackson
Jackson, WY 83001
USA

BUDGETARY

Customer ID	Good Thru	Payment Terms	Sales Rep
WY_JACKSON	10/31/25	Net 30 Days	Bill Thieben

Quantity	Item	Description	Unit Price	Amount
2.00	Metor 6M-32	Metor 6M with 81CM-32 inch Cross Piece-multi-purpose multi-zone walk-through metal detector used primarily for weapons detection.	3,195.00	6,390.00
1.00	Installation	Rapiscan Installation and Basic Operator Instruction. Additional Charges may result if site is not prepared per technical and environmental specifications .	2,500.00	2,500.00
1.00	Warranty-MD	Warranty- Two (2) year parts only (exchange) on entire system from date of shipment (25 months total). Does not cover damages from misuse-abuse-tampering-AOG		
2.00	Metor 28e	Rapiscan Metor 28e hand-held metal detector LEAD TIME IF IN STOCK: 2 WEEKS PRODUCTION:4-6 WEEKS	175.00	350.00

Subtotal	9,240.00
Sales Tax	
Freight	2,200.00
TOTAL	**11,440.00**

Sales Rep Email: bill.thieben@laurussystems.com

For up to date product information-news-manuals and support-Visit us on the Web at www.LaurusSystems.co

Freight Terms-FOB Origin (prepay and add)

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Council Regular Meeting
Submitting Department:	Planning	**Presenter:**	Katelyn Page
Agenda Item:	Boundary Adjustment with Replat of 564 and 570 E Hansen Ave.	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of the Boundary Adjustment process is to ensure that the adjustment of property lines results in property configurations that comply with the standards of these Land Development Regulations (LDRs). The adjustment of boundaries between two or more platted lots requires a new plat approval by the Town Council according to Section 8.5.6 in the LDRs.

Requested Action.
The applicant is requesting approval of a Boundary Adjustment with Replat to reconfigure 564 and 570 E Hansen Ave. legally described as LOT 13, BLK. 6, HALL 7TH ADDITION and LOT 5, E 29' LOT 6, BLK. 6, HALL 1 respectively.

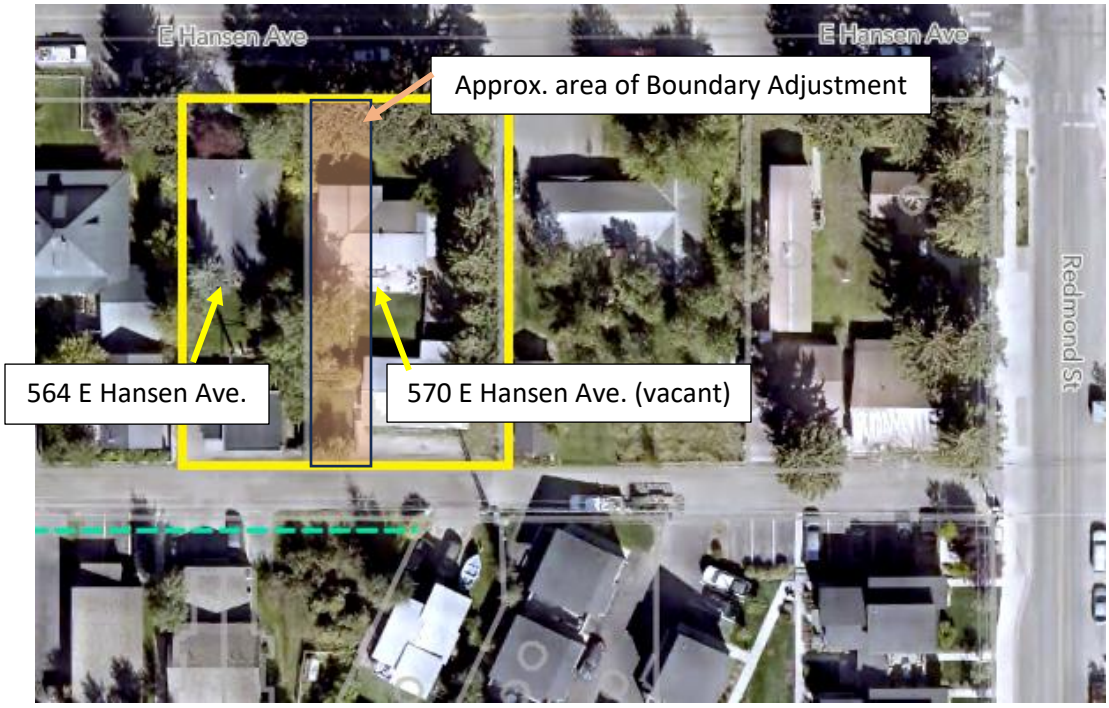
Recommendations.
The Planning Director recommends approval of a Boundary Adjustment with Replat of 564 E. Hansen (to be described as LOT 15, HALL 12th Addition) and 570 E Hansen Ave., (LOT 5, BLK. 6, HALL 1 as originally described on Plat No. 131), subject to the following condition:

1. Within thirty (30) calendar days from the date of Town Council approval, applicant shall satisfactorily address all comments made by the Town of Jackson and other reviewing entities included in the attached Departmental Reviews and submit the corrections to the Planning Department.

Key Policy Questions.
None.

Project Location.
The properties are located at 564 and 570 E. Hansen Ave. as shown in Figure 1 on the following page:

Figure 1



Background.
The property at 564 E. Hansen Ave. (currently LOT 13) is 7,506 sf and contains a single detached dwelling unit with detached garage structure. The property at 570 E. Hansen Ave. is 11,850 sf (currently LOT 5 and E 29' LOT 6) and is vacant lot following recent demolition of a single detached dwelling unit with detached accessory structure. Both properties are generally flat with access to E. Hansen Ave. and the adjacent alley to the south.

Request.
The applicant is requesting approval of a Boundary Adjustment to effectively exchange 0.10 acres between the two properties. The newly proposed Lot 15 (564 E. Hansen Ave.) will include the east 29'of Lot 6 (now part of 570 E. Hansen Ave.) and result in an overall acreage of new Lot 15 of approximately 0.27 acres or 11,850 sf. This results in 570 E. Hansen Ave. being reduced from 11,850 sf to 7,500 sf.

As part of the Boundary Adjustment request, the applicant has prepared an Affidavit Affecting Title, to be signed by the Planning and Building Director, that will void Doc. 0652307 currently recorded with the Teton County Clerk. The purpose of Doc. 0652307 was to clarify terms and conditions of use related to a previous accessory structure on the property that has since been demolished. Following said demolition, Doc. 0652307 is no longer needed.

Analysis.
A Zoning Compliance Verification (ZCV) was completed by the Planning Department as a prerequisite to this Boundary Adjustment request and confirmed that the proposed lot configurations comply with the LDRs.

Staff find that the proposed Boundary Adjustment meets the findings of approval required by LDR Sec. 8.5.6.D (Boundary Adjustment-Findings).

This replat is exempt from Park Exaction fees pursuant to Section 7.5.2.C. - Exemptions which exempts *"Boundary adjustments pursuant to Sec. 8.5.6"*. In addition, this replat is exempt from School Exaction fees pursuant to Section 7.5.3.C. - Exemptions which exempts *"Boundary adjustments pursuant to Sec. 8.5.6"*.

Findings.
Pursuant to Section 8.5.6.D (Boundary Adjustment) of the LDRs, the following findings shall be made for the approval of a replat:

1. ***No additional lots of record are created.***

   Complies. The proposed Boundary Adjustment does not result in additional lots of record.

2. ***Each of the resulting lots of record complies with the zone in which it is located as approved through a zoning compliance verification.***

   Complies. Staff find that the proposed Boundary Adjustment is compliant with the Neighborhood Low Density-4 (NL-4) zone based on ZCV (P25-078) issued on June 19, 2025.

3. ***The applicability and required document provisions of Section 8.5.6 are met.***

   Complies as conditioned. Staff find that the proposed Boundary Adjustment complies with the applicability for Section 8.5.6 as conditioned. In addition, all required documents have been submitted for review at this time, including the final plat with accompanying documents. As conditions, minor edits such as updates to Town employee titles, shall be addressed within 30 days of approval.

4. ***The application shall comply with all other relevant standards on these LDRs and other Town Ordinances.***

   Complies. Staff find that the proposed Boundary Adjustment complies with the provisions of the LDRs. In addition, the subdivision complies with all other Town Ordinances.

5. ***The application is in substantial conformance with all standards or conditions of any prior applicable permits or approvals.***

   Complies. Staff find that the proposed Boundary Adjustment is in substantial conformance with the previously approved ZCV P25-078 and demolition permit DEM25-0007.

Fiscal Impact.
None.

Staff Impact.
The amount of staff time to review, research, and write this report, including future work to send final letters and obtain signatures for the plat, is 12 hours.

Attachments or Links.
Department Reviews
Applicant Submittal

Suggested Motion.
I move to **approve** a Boundary Adjustment and Replat (P25-155) for the properties addressed as 564 E. Hansen Avenue and 570 E. Hansen Avenue, based upon the findings and condition presented in this staff report, the departmental reviews, and this staff report dated October 20, 2025, subject to minor changes by staff.

PERMIT NOTES

Report Run On: Friday, 10 October 2025 10:56

Permit # P25-155 **Parcel # :** 22-41-16-34-1-71-001

Site Address: 564 E HANSEN AVENUE

Project Name: 564 & 570 E Hansen Boundary Adjustment

Note Type	Note Code	Text	Created By	Begin Date	End Date
GENERAL		Revise Paul Anthony Title to read "Town Planning and Building Director".	KPAGE@JACKSONWY.GOV	10/06/25	10/6/25
CONDITIONS		BOUNDARY ADJUSTMENT WITH REPLAT APPROVED w CONDTITIONS P25-155 ADDRESS: 564 & 570 Hansen Ave. OWNER: Edgar D Jannotta, Jr, Trustee of the Jannotta 2007 Split Purchase QPRT dated 10-06-2007 APPLICANT: Cirque Consulting, LLC, George Putnam 9/16/2025 Ismael Jimenez, Brian Lenz, 733-3079 DATE OF SUBMITTAL: 08/21/2025 DATE OF MATERIALS: 08/12/2025 REVISION NO.: 00 BOND FOR MONUMENTATION: $3,000.00 (6 monuments) Bond will be released once monumentation for the subdivision has been set or verified to be in place and not disturbed by written statement by a licensed surveyor. The engineering division has reviewed your application for a BOUNDARY ADJUSTMENT WITH REPLAT submitted on and with application materials as dated above. PRIOR TO PLAT APPROVAL THE FOLLOWING SHALL BE ADDRESSED: NOTES 1. For lot splits where each lot has direct access to water and sewer mains from the property, but the services have not been installed, add a note: AT TIME OF PLAT WATER AND SEWER SERVICES TO LOT 5 ARE NOT INSTALLED. CERTIFICATE OF OWNER Add the following notes: 1. that access to sewer and water facilities, including pipelines, manholes, meters and valves, is hereby granted to the Town of Jackson; and, 2. that access across the driveways located within this subdivision is hereby granted to emergency vehicles including ambulances, utility, firefighting, and police vehicles; and, 3. that this subdivision is subject to rights-of-way, easements, restrictions, reservations, and conditions, of sight or of record, including but not limited to those shown hereon.	IJIMENEZ@JACKSONWY.GOV	09/16/25	9/16/25

PERMIT NOTES

Report Run On: Friday, 10 October 2025 10:56

Note Type	Note Code	Text	Created By	Begin Date	End Date
GENERAL		Surveyor's Review	MTIPPETTS@JACKSONWY.GOV	09/15/25	
GENERAL		Survey Review: It is customary and preferable for the Surveyor, Owner, plat Date, and Subdivision Summary information to be located in the lower-right corner of the plat sheet. The Mayors name should be shown as Arne O. Jorgensen A Water System note is required per WS 18-5-306 A Waster Water system note is required per WS 18-5-306	MTIPPETTS@JACKSONWY.GOV	09/15/25	
GENERAL		County Clerk Review The title of the plat will need a different name. There is already an 8th filing (and a few more since then). Change name under the Certificate of Approval section as well. Signature line for Arne should say Town Mayor Statement of Considerations for assessors office will need to accompany the deeds. Per staff email with Clerk 9/15/2025 - applicant shall utilize "12th addition to"	MTIPPETTS@JACKSONWY.GOV	09/03/25	

CIRQUE
Consulting

PO Box 7775
Jackson, WY 83002 307-413-5424

August 12, 2025

Town of Jackson Planning and Building
P.O. Box 1687
Jackson, WY 83001

RE: Boundary Line Adjustment – with Replat for 564 & 570 E. Hansen Ave.

Dear Planning Staff,

On behalf of the owners, East Hansen Properties, LLC and Edgar D. Jannotta Jr, Trustee, please accept this letter and the accompanying materials for a for a Boundary Line Adjustment with Final Plat for Lot 13, No. 1010, and the east 29 Feet of Lot 6, Block 6, Plat No. 131, located at 564 and 570 E. Hansen Ave. This submittal is in accordance with the issued Zoning Compliance Verification P25-078.

Included for your review are the following:

- Planning Application
- Final Plat Findings According to LDR Section 8.5.4
- Draft Final Plat
- Title Report
- Draft Affidavits of Acknowledgements and Acceptance of Plat
- Draft Affidavit Affecting Title RE: Release of Single Family Residence Affidavit
- Draft Quit Claim Deeds from E. Hansen Prop. and E. D. Jannotta Jr. Trustee
- Draft Warranty Deed E. Hansen Prop. to E. D. Jannotta Jr. Trustee
- Published Notice of Intent to Subdivide

The owner East Hansen Properties, LLC requests the Director of Planning and Building consider the attached Draft Affidavit Affecting Title to release all terms and conditions included in the Single Family Residence Affidavit executed in 2005 by Town of Jackson Associate Planner Phyllis Lamken. All structures subject to the terms of the 2005 Affidavit will be permanently removed from the subject property prior to recordation of this Final Plat per DEM25-007.

Please do not hesitate to contact me at (307) 413-5424 should you have any questions with this submittal. We look forward to hearing from you upon your sufficiency determination.

Sincerely,

George Putnam Digitally signed by George Putnam
Date: 2025.08.12 11:53:59 -06'00'

George Putnam
Cirque Consulting, LLC

CIRQUE
Consulting

PO Box 7775
Jackson, WY 83002 307-413-5424

Section 8.5.4.C Subdivision - <u>Findings</u>

A Final Plat shall be approved upon finding that:

1. Is in substantial conformance with an approved development plan or development option plan or is a condominium or townhouse subdivision of existing physical development;

This finding can be made. The John D. Hall Eighth Addition final plat formalizes a boundary line adjustment between platted lots. The proposed boundary adjustment configuration received zoning compliance verification approval under P25-078.

2. Complies with the standards of this Section;

This finding can be made. The John D. Hall Eighth Addition final plat complies with standards of this section (8.5.4) with respect to Purpose, Applicability, Findings, and Plat Content. No subdivision improvement agreement is contemplated or required as the lots have direct access to public Hansen Ave./ rear alley and existing connections or the ability for future connections to the Town of Jackson water and sewer facilities.

3. Complies with the subdivision standards of DIV 7.2; and

This finding can be made. The proposed boundary adjustment requires a re-plat of existing lots within existing subdivision additions to the Town of Jackson. No changes are proposed that will change compliance with standards of Division 7.2.

4. Complies with all other relevant standards of these LDR's and other Town Ordinances;

This finding can be made. The proposed adjusted lots as shown on the attached draft The John D. Hall Eighth Addition Final Plat as acknowledged on the issued ZCV P25-078, demonstrate compliance with all relevant development standards, building setbacks, vehicle access standards, site development, and allowed uses included in the LDRs for the project under the NL-4 zone.

PLANNING PERMIT APPLICATION
Planning & Building Department

150 E Pearl Ave.
P.O. Box 1687
Jackson, WY 83001

ph: (307) 733-0440
www.townofjackson.com

For Office Use Only

Fees Paid_____ Date & Time Received _____

Application #s _____ _____ _____

Please note: *Applications received after 3 PM will be processed the next business day.*

PROJECT.

Name/Description: 564 & 570 E. Hansen Boundary Line Adjustment

Physical Address: 564 & 570 E. Hansen Ave. Jackson WY

Lot, Subdivision: Lot 13, John D. Hall 7th, Plat No. 1010 and the E. 29 ft. of Lot 6 Blk 6, John D. Hall 1st, Plat No. 131

PIDN: 24-41-16-34-1-71-001
24-41-16-34-1-24-003

PROPERTY OWNER.

Name: See Attached Phone: _____

Mailing Address: _____ ZIP: _____

E-mail: _____

APPLICANT/AGENT.

Name: Cirque Consulting, LLC, George Putnam Phone: 307-413-5424

Mailing Address: PO Box 7775 ZIP: 83002

E-mail: gputnam@cirqueconsulting.com

DESIGNATED PRIMARY CONTACT.

_____Property Owner X_____Applicant/Agent

TYPE OF APPLICATION. *Please check all that apply; review the type of application at www.townofjackson/200/Planning*

Use Permit

_____Basic Use

_____Conditional Use

_____Special Use

Relief from the LDRs

_____Administrative Adjustment

_____Variance

_____Beneficial Use Determination

_____Appeal of an Admin. Decision

Physical Development

_____Sketch Plan

_____Development Plan

_____Design Review

Subdivision/Development Option

_____ Subdivision Plat

X_____Boundary Adjustment (replat)

_____Boundary Adjustment (no plat)

_____Development Option Plan

Interpretations

_____Formal Interpretation

_____Zoning Compliance Verification

Amendments to the LDRs

_____LDR Text Amendment

_____Map Amendment

Miscellaneous

_____**Other:**_____

_____Environmental Analysis

PRE-SUBMITTAL STEPS. *To see if pre-submittal steps apply to you, go to www.townofjackson.com/200/Planning and select the relevant application type for requirements. Please submit all required pre-submittal steps with application.*

Pre-application Conference #: _____ Environmental Analysis #: _____

Original Permit #: _____ Date of Neighborhood Meeting: _____

SUBMITTAL REQUIREMENTS. *Please ensure all submittal requirements are included. The Planning Department will not hold or process incomplete applications. Partial or incomplete applications will be returned to the applicant. Go to www.townofjackson.com/200/Planning and select the relevant application type for submittal requirements.*

Have you attached the following?

X **Application Fee.** Fees are cumulative. Go to www.townofjackson.com/200/Planning and select the relevant application type for the fees.

X **Notarized Letter of Authorization.** A notarized letter of consent from the landowner is required if the applicant is not the owner, or if an agent is applying on behalf of the landowner. Please see the Letter of Authorization template at http://www.townofjackson.com/DocumentCenter/View/845/LetterOfAuthorization-PDF.

X **Response to Submittal Requirements**. The submittal requirements can be found on the TOJ website for the specific application. If a pre-application conference is required, the submittal requirements will be provided to applicant at the conference. The submittal requirements are at www.townofjackson.com/200/Planning under the relevant application type.

Note: Information provided by the applicant or other review agencies during the planning process may identify other requirements that were not evident at the time of application submittal or a Pre-Application Conference, if held. Staff may request additional materials during review as needed to determine compliance with the LDRs.

Under penalty of perjury, I hereby certify that I have read this application and associated checklists and state that, to the best of my knowledge, all information submitted in this request is true and correct. I agree to comply with all county and state laws relating to the subject matter of this application, and hereby authorize representatives of Teton County to enter upon the above-mentioned property during normal business hours, after making a reasonable effort to contact the owner/applicant prior to entering.

George Putnam Digitally signed by George Putnam Date: 2025.08.12 11:20:16 -06'00' 8/12/25

Signature of Property Owner or Authorized Applicant/Agent Date

George Putnam Principal

Name Printed Title

LETTER OF AUTHORIZATION

Edgar D. Jannotta, Jr., Trustee of the Jannotta 2007 Split Purchase QPRT dated 10-06-2007 **"Owner" whose address is:** PO Box 504, Teton Village, WY 83025

(NAME OF ALL INDIVIDUALS OR ENTITY OWNING THE PROPERTY)

, as the owner of property more specifically legally described as: Lot 13 of the John D. Hall 7th Addition to the Town of Jackson, Plat No. 1010, with a street address of 564 E. Hansen Ave.

(If too lengthy, attach description)

HEREBY AUTHORIZES Cirque Consulting, LLC **as agent to represent and act for Owner in making application for and receiving and accepting on Owners behalf, any permits or other action by the Town of Jackson, or the Town of Jackson Planning, Building, Engineering and/or Environmental Health Departments relating to the modification, development, planning or replatting, improvement, use or occupancy of land in the Town of Jackson. Owner agrees that Owner is or shall be deemed conclusively to be fully aware of and to have authorized and/or made any and all representations or promises contained in said application or any Owner information in support thereof, and shall be deemed to be aware of and to have authorized any subsequent revisions, corrections or modifications to such materials. Owner acknowledges and agrees that Owner shall be bound and shall abide by the written terms or conditions of issuance of any such named representative, whether actually delivered to Owner or not. Owner agrees that no modification, development, platting or replatting, improvement, occupancy or use of any structure or land involved in the application shall take place until approved by the appropriate official of the Town of Jackson, in accordance with applicable codes and regulations. Owner agrees to pay any fines and be liable for any other penalties arising out of the failure to comply with the terms of any permit or arising out of any violation of the applicable laws, codes or regulations applicable to the action sought to be permitted by the application authorized herein.**

Under penalty of perjury, the undersigned swears that the foregoing is true and, if signing on behalf of a corporation, partnership, limited liability company or other entity, the undersigned swears that this authorization is given with the appropriate approval of such entity, if required.

OWNER: _____

(SIGNATURE) (SIGNATURE OF CO-OWNER)

***Title*:** Trustee

(if signed by officer, partner or member of corporation, LLC (secretary or corporate owner) partnership or other non-individual Owner)

STATE OF Wyoming)
)**SS.**
COUNTY OF Teton)

The foregoing instrument was acknowledged before me by Edgar Jannotta this 24th day of April, 2025

WITNESS my hand and official seal.

_____ **(Seal)**

(Notary Public)

My commission expires: 10/25/28

BRITTANY THOMPSON
NOTARY PUBLIC
STATE OF WYOMING
COMMISSION ID: 162084
MY COMMISSION EXPIRES: 10/25/2028

LETTER OF AUTHORIZATION

East Hansen Properties, LLC ,"Owner" whose address is: _____

PO Box 504, Teton Village, WY 83025

(NAME OF ALL INDIVIDUALS OR ENTITY OWNING THE PROPERTY)

_____, as the owner of property

more specifically legally described as: Lot 5 and the east 29 feet of Lot 6, Block 6, Hall 1st, Plat No. 131 with a street address of 570 E. Hansen Ave.

(If too lengthy, attach description)

HEREBY AUTHORIZES Cirque Consulting, LLC as agent to represent and act for Owner in making application for and receiving and accepting on Owners behalf, any permits or other action by the Town of Jackson, or the Town of Jackson Planning, Building, Engineering and/or Environmental Health Departments relating to the modification, development, planning or replatting, improvement, use or occupancy of land in the Town of Jackson. Owner agrees that Owner is or shall be deemed conclusively to be fully aware of and to have authorized and/or made any and all representations or promises contained in said application or any Owner information in support thereof, and shall be deemed to be aware of and to have authorized any subsequent revisions, corrections or modifications to such materials. Owner acknowledges and agrees that Owner shall be bound and shall abide by the written terms or conditions of issuance of any such named representative, whether actually delivered to Owner or not. Owner agrees that no modification, development, platting or replatting, improvement, occupancy or use of any structure or land involved in the application shall take place until approved by the appropriate official of the Town of Jackson, in accordance with applicable codes and regulations. Owner agrees to pay any fines and be liable for any other penalties arising out of the failure to comply with the terms of any permit or arising out of any violation of the applicable laws, codes or regulations applicable to the action sought to be permitted by the application authorized herein.

Under penalty of perjury, the undersigned swears that the foregoing is true and, if signing on behalf of a corporation, partnership, limited liability company or other entity, the undersigned swears that this authorization is given with the appropriate approval of such entity, if required.

OWNER: _____

(SIGNATURE) (SIGNATURE OF CO-OWNER)

Title: Manager

(if signed by officer, partner or member of corporation, LLC (secretary or corporate owner) partnership or other non-individual Owner)

STATE OF Wyoming)
)SS.
COUNTY OF Teton)

The foregoing instrument was acknowledged before me by Erika Pearsall this 24th day of April, 2025.

WITNESS my hand and official seal.

(Seal)

_____

(Notary Public)

My commission expires: 10/25/28

BRITTANY THOMPSON
NOTARY PUBLIC
STATE OF WYOMING
COMMISSION ID: 162084
MY COMMISSION EXPIRES: 10/25/2028

PLANNING & BUILDING DEPARTMENT

June 19, 2025

George Putnam
Cirque Consulting
PO Box 7775
Jackson, WY 83002

RE: P25-078 Zoning Compliance Verification (ZCV)
Boundary Line Adjustment 564 & 570 E. Hansen Ave.

Dear Mr. Putnam:

Thank you for submitting a request for a Zoning Compliance Verification (ZCV) for the proposed Boundary Adjustment between the above-referenced lots, which are described as Lot 13 John D. Hall Seventh Addition to the Town of Jackson (564 E. Hansen Ave.) and Lot 5 and the east 29 feet of Lot 6, Block 6, John D. Hall First Addition to the Town of Jackson (570 E. Hansen Ave.). According to Land Development Regulation (LDR) 8.5.6.C.2, approval of a Boundary Adjustment between platted lots falls to the discretion of the Town Council and requires the submittal of a new plat and an instrument to convey the new reconfigured lots. Prior to submittal of a Boundary Adjustment, Section 8.5.6 (Boundary Adjustment) requires a ZCV letter to be submitted and approved by the Planning Director. This ZCV letter is intended to meet this requirement.

Existing Conditions & Request:

The subject properties are located within the Neighborhood Low Density-4 (NL-4) zoning district, which allows for a Boundary Adjustment between platted lots. Lot 13 is a 50'x150' lot (7,500 sf), and Lot 5 is a 79'x150' lot (11,850 sf), which both meet the minimum lot size of 7,500 sf for this zone. Both lots have vehicular access from E. Hasnen Ave. The proposal seeks to enlarge Lot 13 by shifting the dividing property line east and absorbing the western 29' of Lot 5, resulting in Lot 13 (renumbered to Lot 15) being 79'x150' and Lot 5 being 50'x150'. Both lots would still comply with the minimum lot size of 7,500 sf, and no new lots are being created. Because the dividing property line between these lots would shift east by 29', the existing structures on Lot 5 would need to be demolished prior to recording the boundary adjustment replat to avoid creating nonconformities. Staff notes that the applicant has already applied for a demo permit to remove all structures on Lot 5 per DEM25-0007.

Findings for ZCV (Section 8.6.3.C.)

In order to issue a ZCV the Planning Director shall find that the property, portion of the property, or attribute of the property in question:

1. Complies with all relevant standards of these LDRs and other Town Ordinances.

   Complies. Staff is able to make the finding that the proposed boundary adjustment meets the standards of these LDRs and other Town Ordinances. Both Lot 15 and ot 6 comply with the minimum lot size of 7,500 sf. In addition, there is no change to access nor are there any structures affected by the change in lot boundaries because all structures on Lot 5 will be demolished.

2. Is in substantial conformance with all standards or conditions of any prior applicable permits or approvals.

   Complies. Not applicable to this review.

This zoning compliance shall only verify zoning compliance at the time it is issued pursuant to Division 8.6.3 Zoning Compliance Verification of the Town of Jackson Land Development Regulations. In order to finalize the adjustment of the boundaries between these platted lot, please submit a Boundary Adjustment to the Town of Jackson Planning Department which includes the documents listed under LDR Section 8.5.6.C.2. Platted Lots.

If you should have any further questions, please contact me at 307-733-0440, ext. 1305 or tvalentine@jacksonwy.gov.

Sincerely,

Tyler Valentine
Senior Planner

This Zoning Compliance Verification shall only verify zoning compliance at the time it is issued pursuant to Division 8.6.3 (Zoning Compliance Verification) of the Town of Jackson Land Development Regulations (LDRs). Should you have any questions or require further information on this matter, please contact me by phone at 307-734-0440 x 1305 or by email at tvalentine@jacksonwy.gov.

Sincerely,

Tyler Valentine, AICP
Senior Planner

ZCV for Hansen Ave. Boundary Line Adjustment
Property Owners

Lot 13, Plat 1010 – 564 E. Hansen Ave.

PIDN: 24-41-16-34-1-71-001

Edgar D. Jannotta Jr., Trustee, of the Jannotta Split QPRT dated October 6, 2007
PO Box 504
Teton Village, WY 83025

Lot 5 and the E. 29 ft. of Lot 6, Plat 131 – 570 E. Hansen Ave.

PIDN: 24-41-16-34-1-24-003

East Hansen Properties, LLC
PO Box 504
Teton Village, WY 83025

OWNERSHIP AND ENCUMBRANCE REPORT

Issued To:

Cirque Consulting, LLC

Report No.: 25001010-41

Effective Date: February 11, 2025

Current Date: February 19, 2025

Cost:$ 350.00

Project Reference: LOT 13, BLK. 6, HALL 7TH ADDITION

Property Address: 564 E Hansen Avenue, Jackson, WY 83001

County: Teton

1. According to the last deed appearing of public record, title to the fee simple estate or interest in the land described or referred to in this Report at the effective date hereof appears to be vested in:

   Edgar D. Jannotta, Jr., Trustee of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto

2. The land referred to in this Report is described as follows:

   See Exhibit "A" Attached Hereto and Made a Part Hereof

Issued By:

Jackson Hole Title & Escrow
Tyra Tafoya, Escrow Officer
Phone: 307-733-3153

This Ownership and Encumbrance Report is not a Commitment for Title Insurance nor is it an Abstract of Title. This Ownership and Encumbrance Report is for informational purposes only, does not necessarily contain all defects, liens or encumbrances of record, and may not be relied upon as a representation of the record regarding the subject property, and no liability is assumed hereby. If it is desired that liability be assumed prior to the issuance of a policy of title insurance, a Binder or Commitment should be requested.

EXHIBIT "A"

LEGAL DESCRIPTION

Lot 13 of the John D. Hall Seventh Addition to the Town of Jackson, Teton County, Wyoming, according to that plat recorded in the Office of the Teton County Clerk on April 20, 2001 as Plat No. 1010.

ENCUMBRANCES WHICH AFFECT THE SUBJECT PROPERTY APPEAR TO BE (BUT ARE NOT NECESSARILY LIMITED TO) THE FOLLOWING:

1. 2025 taxes and special assessments are a lien; amounts not yet determined or payable. If making one payment, due on or before December 31. If making two payments, the first one-half is payable September 1 and becomes delinquent November 10th of the current year, the second one-half is payable March 1 and becomes delinquent May 10th of the following year.

   General taxes as set forth below. Any amounts not paid when due will accrue penalties and interest in addition to the amount stated herein:
   Tax ID# OJ-005481
   Tax Year 2024
   1st Half Tax Status $6,194.51 is Paid
   2nd Half Tax Status $6,194.51 is Paid

2. Covenants, conditions, restrictions, reservations, easements, encroachments, ditches, roadways, rights-of-way, common areas and building set back requirements as delineated on the recorded Plat Number(s) 1010 and 131, records of Teton County, Wyoming.

3. Affidavit Affecting Title executed by Tamalpais Roth-McCormick appearing of record in Book 420 of Photo, Pages 378-380, records of Teton County, Wyoming.

INFORMATIONAL NOTES:

A. Other than as shown in Schedule B; we find no Judgment Liens, State Tax Liens, Federal Tax Liens or Child Support Liens of record which attach to the name(s) or interest of the vested owner and/or proposed insured owner/borrower.

B. According to Official Records, there have been no documents conveying the land described herein within a period of 24 months prior to the date of this commitment, except as follows: None

********** End of Schedule B **********

OWNERSHIP AND ENCUMBRANCE REPORT

Issued To:

Cirque Consulting, LLC

Report No.: 25001017-41

Effective Date: February 11, 2025

Current Date: February 19, 2025

Cost:$ 350.00

Project Reference: LOT 5, E 29' LOT 6, BLK. 6, John D Hall

Property Address: 570 E Hansen Avenue, Jackson, WY 83001

County: Teton

1. According to the last deed appearing of public record, title to the fee simple estate or interest in the land described or referred to in this Report at the effective date hereof appears to be vested in:

   East Hansen Properties, LLC, a Wyoming limited liability company

2. The land referred to in this Report is described as follows:

   See Exhibit "A" Attached Hereto and Made a Part Hereof

Issued By:

Jackson Hole Title & Escrow
Tyra Tafoya, Escrow Officer
Phone: 307-733-3153

This Ownership and Encumbrance Report is not a Commitment for Title Insurance nor is it an Abstract of Title. This Ownership and Encumbrance Report is for informational purposes only, does not necessarily contain all defects, liens or encumbrances of record, and may not be relied upon as a representation of the record regarding the subject property, and no liability is assumed hereby. If it is desired that liability be assumed prior to the issuance of a policy of title insurance, a Binder or Commitment should be requested.

EXHIBIT "A"

LEGAL DESCRIPTION

Lot 5 and the East 29 feet of Lot 6 of Block 6 of the John D. Hall Plat, Town of Jackson, Teton County, Wyoming, according to that plat recorded in the Office of the Teton County Clerk on August 12, 1947 as Plat No. 131.

ENCUMBRANCES WHICH AFFECT THE SUBJECT PROPERTY APPEAR TO BE (BUT ARE NOT NECESSARILY LIMITED TO) THE FOLLOWING:

1. 2025 taxes and special assessments are a lien; amounts not yet determined or payable. If making one payment, due on or before December 31. If making two payments, the first one-half is payable September 1 and becomes delinquent November 10th of the current year, the second one-half is payable March 1 and becomes delinquent May 10th of the following year.

   General taxes as set forth below. Any amounts not paid when due will accrue penalties and interest in addition to the amount stated herein:
   Tax ID# OJ-001780
   Tax Year 2024
   1st Half Tax Status $6,467.66 is Paid
   2nd Half Tax Status $6,467.65 is Paid

2. Covenants, conditions, restrictions, reservations, easements, encroachments, ditches, roadways, rights-of-way, common areas and building set back requirements as delineated on the recorded Plat Number(s) 131, records of Teton County, Wyoming.

3. Affidavit Affecting Title appearing of record in Book 591 of Photo, Page 865, records of Teton County, Wyoming.

INFORMATIONAL NOTES:

A. Other than as shown in Schedule B; we find no Judgment Liens, State Tax Liens, Federal Tax Liens or Child Support Liens of record which attach to the name(s) or interest of the vested owner and/or proposed insured owner/borrower.

B. According to Official Records, there have been no documents conveying the land described herein within a period of 24 months prior to the date of this commitment, except as follows: None

********** End of Schedule B **********

Affidavit of
Acknowledgment and
Acceptance of Final Plat

KNOW ALL PERSONS BY THESE PRESENTS:

Edgar D. Jannotta Jr, Trustee of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto, does hereby depose and say:

1. that the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, owns real property according to that Warranty Deed recorded as Document No. 0714369 in the Office of the Clerk of Teton County, Wyoming, known as Lot 13 of the John D. Hall Seventh Addition to the Town of Jackson, Teton County, according to that plat recorded in said Office as Plat No. 1010;

2. that I have examined a copy of the Final Plat of the proposed subdivision titled **John D. Hall Eighth Addition to the Town of Jackson** dated _____, 2025;

3. that I hereby consent to the subdivision as described in the Certificate of Surveyor and Certificate of Owner found on said plat;

4. that I intend that my signature to and the recording of this Affidavit shall have the same force and effect as my signature to the Certificate of Owner as contained on said Final Plat for **John D. Hall Eighth Addition to the Town of Jackson.**

DATED this ____ day of _____, 2025

The Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto

By:

_____
(signature)

Edgar D. Jannotta, Jr, Trustee

DRAFT

STATE OF _____)
)ss.
COUNTY OF _____)

The foregoing Affidavit of Acknowledgement and Acceptance of Final Plat being subscribed and sworn to before me by Edgar D. Jannotta Jr, Trustee of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto, this _____ day of _____, 2025.

Witness my hand and official seal.

_____
Notary Public

My Commission Expires:

DRAFT

Affidavit of
Acknowledgment and
Acceptance of Final Plat

KNOW ALL PERSONS BY THESE PRESENTS:

_____, authorized person for East Hansen Properties, LLC, a Wyoming limited liability company does hereby depose and say:

1. that East Hansen Properties, LLC, a Wyoming limited liability company, owns real property according to that Warranty Deed recorded as Document No. 1048922 in the Office of the Clerk of Teton County, Wyoming, known as the east 29 feet of Lot 6, Block 6 of the John D. Hall Addition to the Town of Jackson, Teton County, according to that plat recorded in said Office as Plat No. 131;

2. that I have examined a copy of the Final Plat of the proposed subdivision titled **John D. Hall Eighth Addition to the Town of Jackson** dated _____, 2025;

3. that I hereby consent to the subdivision as described in the Certificate of Surveyor and Certificate of Owner found on said plat;

4. that I intend that my signature to and the recording of this Affidavit shall have the same force and effect as my signature to the Certificate of Owner as contained on said Final Plat for **John D. Hall Eighth Addition to the Town of Jackson.**

DATED this ____ day of _____, 2025

East Hansen Properties, LLC
a Wyoming Limited Liability Company

By:

_____
(signature)

_____
(print name)
Its: authorized person

DRAFT

STATE OF _____)
)ss.
COUNTY OF _____)

The foregoing Affidavit of Acknowledgement and Acceptance of Final Plat being subscribed and sworn to before me by _____, authorized person for East Hansen Properties, LLC, a Wyoming limited liability company, this _____ day of _____, 2025.

Witness my hand and official seal.

_____
Notary Public My Commission Expires:

DRAFT

Affidavit Affecting Title
RE: Release of Single Family Residence Affidavit

Comes now PAUL ANTHONY, DIRECTOR OF PLANNING AND BUILDING, TOWN OF JACKSON, who being sworn on his oath, deposes and says:

THAT on June 6, 2005, Phyllis Lamkin, Associate Planner for the Town of Jackson, did execute that "Single Family Residence Affidavit" ("the 2005 Affidavit") recorded as Document No. 0652307 in the Office of the Clerk of Teton County, Wyoming subject to the property located at 570 E. Hansen Ave., Jackson, Wyoming, ("the Property") being further described as:

> **Lot 5 and the east 29 feet of Lot 6 Block 6 of the John D. Hall Addition to the Town of Jackson, recorded as Plat No. 131 in the Office of the Clerk of Teton County, Wyoming. (PIDN: 22-41-16-34-1-24-003)**

THAT on _____, 2025, the Town of Jackson issued demolition permit DEM25-0007 that authorized permanent removal of all structures located on the Property.

THAT in accordance with DEM25-0007, as of _____, 2025, all structures have been removed from the Property.

THAT in consideration of removal of all structures from the Property, the terms and conditions contained in the 2005 Affidavit are no longer applicable and are hereby forever waived and released.

THAT future development of the Property shall be subject to applicable zone-specific standards included in the Town of Jackson Land Development Regulations.

Further your Affiant sayeth naught.

_____
Paul Anthony,
Director of Planning & Building, Town of Jackson

STATE OF WYOMING)
)ss
COUNTY OF TETON)

The foregoing Affidavit Affecting Title being subscribed, sworn to and acknowledged before me by Paul Anthony, Director of Planning & Building, Town of Jackson, this _____ day of _____, 2025.

WITNESS my hand and official seal.

_____
Notary Public
My Commission Expires:

DRAFT

QUITCLAIM DEED

EDGAR D. JANNOTTA JR, TRUSTEE of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto, GRANTOR, of Teton County, Wyoming, for and in consideration of Ten Dollars ($10.00) and other good and valuable consideration, receipt of which is hereby acknowledged, CONVEYS and QUITCLAIMS to, **EAST HANSEN PROPERTIES, LLC a Wyoming limited liability company**, GRANTEE, whose address is P.O. Box 504, Teton Village, WY 83025, all right, title, and interest now owned in and to the following described real estate situate in the County of Teton, State of Wyoming, hereby waiving and releasing all rights under and by virtue of the homestead exemption laws of the State of Wyoming, to-wit:

Lot 5 of the John D. Hall Addition to the Town of Jackson,
according to Plat No. 131

State Parcel ID No.:_____

DATED this ____ day of _____, 2025

The Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto

By:

_____
(signature)

Edgar D. Jannotta, Jr, Trustee

DRAFT

STATE OF _____)
)ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me by Edgar D. Jannotta Jr, Trustee of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto, this _____ day of _____, 2025.

Witness my hand and official seal.

_____
Notary Public

My Commission Expires:

DRAFT

QUITCLAIM DEED

EAST HANSEN PROPERTIES, LLC a Wyoming limited liability company, GRANTOR, of Teton County, Wyoming, for and in consideration of Ten Dollars ($10.00) and other good and valuable consideration, receipt of which is hereby acknowledged, CONVEYS and QUITCLAIMS to **EDGAR D. JANNOTTA JR, TRUSTEE of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto**, GRANTEE, whose address is P.O. Box 504, Teton Village, WY 83025, all right, title, and interest now owned in and to the following described real estate situate in the County of Teton, State of Wyoming, hereby waiving and releasing all rights under and by virtue of the homestead exemption laws of the State of Wyoming, to-wit:

Lot 15 of the John D. Hall Eighth Addition to the Town of Jackson

State Parcel ID No.:_____

DATED this ____ day of _____, 2025

East Hansen Properties, LLC
a Wyoming Limited Liability Company

By:

_____
(signature)

_____
(print name)
Its: authorized person

DRAFT

STATE OF _____)
)ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me by _____, authorized person for East Hansen Properties, LLC, a Wyoming limited liability company, this _____ day of _____, 2025.

Witness my hand and official seal.

_____
Notary Public

My Commission Expires:

DRAFT

WARRANTY DEED

EAST HANSEN PROPERTIES, LLC a Wyoming limited liability company, GRANTOR, of Teton County, Wyoming, for and in consideration of Ten Dollars ($10.00) and other good and valuable consideration, receipt of which is hereby acknowledged, CONVEYS and WARRANTS to **EDGAR D. JANNOTTA JR, TRUSTEE of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto**, GRANTEE, whose address is P.O. Box 504, Teton Village, WY 83025, all right, title, and interest in and to the real property described in **Exhibit A** attached hereto and made a part hereof, hereby waiving and releasing all rights under and by virtue of the homestead exemption laws of the State of Wyoming, to-wit:

See Exhibit A.

Including and together with all and singular the tenements, hereditaments, appurtenances and improvements thereon or thereunto belonging, but SUBJECT TO taxes, assessments, covenants, conditions, restrictions, reservations, encroachments, rights-of-ways and easements of sight or record;

DATED this ____ day of _____, 2025

East Hansen Properties, LLC
a Wyoming Limited Liability Company

By:

_____
(signature)

_____
(print name)
Its: authorized person

DRAFT

STATE OF _____)
)ss.
COUNTY OF _____)

The foregoing instrument was acknowledged before me by _____, authorized person for East Hansen Properties, LLC, a Wyoming limited liability company, this _____ day of _____, 2025.

Witness my hand and official seal.

_____
Notary Public

My Commission Expires:

DRAFT

Exhibit A
Legal Description of
Portion of Lot 6, Block 6, Plat No. 131

A parcel of land located within the W1/2NE1/4 of Section 34, T. 41 N., R. 116 W., 6th P.M., Teton County, Wyoming, being more particularly described by the following metes and bounds:

BEGINNING at the northwest corner of Lot 5, Block 6, of the John D. Hall Addition to the Town of Jackson, recorded as Plat No. 131 in the Office of the Clerk of Teton County, Wyoming, as marked by a 24-inch long, 5/8-inch diameter rebar with 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE S 0°38'08" W, 149.87 Feet, to the southwest corner of said Lot 5, as marked by a 24-inch long, 5/8-inch diameter rebar with 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;

THENCE N 89°34'01" W, 28.39 feet, along the south line of Lot 6, Block 6, of said Plat No. 131, to a point;

THENCE N 0°25'36" E, 149.89 feet, departing said south line to a point of intersection with the north line of said Lot 6;

THENCE S 89°30'31" E, 28.94, along said north line to the **POINT OF BEGINNING**;

Said parcel encompasses 0.10 acres (4,296 square feet), more or less.

All in accordance with the John D. Hall Eighth Addition to the Town of Jackson, recorded in the Office of the Clerk of Teton County, Wyoming on _____, 2025 as Plat No. _____

Enclosure Surveying Project No. 25002; Prepared by MWW on 8/6/2025; Reviewed by Mark Fellermann Wyoming PLS 16012

NOTICE OF INTENT TO SUBDIVIDE

Notice is hereby given that in accordance with Chapter 18-5-306 Wyoming Statutes, 1977, as amended, that East Hansen Properties, LLC and Edgar D. Jannotta Jr. Trustee of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto, owners of lands referred to as Lot 13 of the John D. Hall Seventh Addition to the Town of Jackson, recorded as Plat No. 1010, and the east 29 feet of Lot 6, Block 6, of the John D. Hall Addition to the Town of Jackson, recorded as Plat No. 131, intend to apply for a subdivision permit to adjust the boundary between their respective Lots. The project is generally located at 564 & 570 E. Hansen Ave., Jackson, Wyoming.

Filing for said permit will occur at a regular meeting of the Jackson Town Council. Please contact the Town of Jackson Planning Department at (307) 733-0440 for the scheduled meeting date and additional information.

Publish August 6 and 13, 2025

OWNER

EAST HANSEN PROPERTIES, LLC &
EDGAR D. JANNOTTA JR., TRUSTEE
PO BOX 504, TETON VILLAGE, WY 83025

SURVEYOR

ENCLOSURE SURVEYING
PO BOX 4552
JACKSON, WYOMING 83001
PHONE: 307-222-4336

SUBDIVISION

NUMBER OF LOTS: 1
TOTAL PROJECT ACREAGE: 0.27 ACRES

DRAFTING

PREPARATION DATE: JULY 9, 2025
FINAL REVISION DATE: XXXXX, 2025

GENERAL NOTES

THE SURFACE ESTATE OF THE LAND IN THIS BOUNDARY ADJUSTMENT IS SUBJECT TO THE FULL AND EFFECTIVE DEVELOPMENT OF THE MINERAL ESTATE.

SELLER DOES NOT WARRANT TO THE PURCHASER THAT THEY HAVE ANY RIGHTS TO THE NATURAL FLOW OF ANY STREAM WITHIN OR ADJACENT TO THIS SUBDIVISION.

NO FAULTS EXIST WITHIN THIS BOUNDARY ADJUSTMENT PER 2019 MAP PRODUCED BY THE WYOMING STATE GEOLOGICAL SURVEY.

WYOMING LAW DOES NOT RECOGNIZE ANY RIPARIAN RIGHTS TO THE CONTINUED NATURAL FLOW OF A STREAM OR RIVER TO PERSONS LIVING ON THE BANKS OF THE STREAM OR RIVER.

THIS SUBDIVISION SHALL NOT BE SUBJECT TO FURTHER DIVISIONS, EXCEPT IN ACCORDANCE WITH AND AS PERMITTED BY THE TOWN OF JACKSON LAND DEVELOPMENT REGULATIONS.

LEGEND

- 24-inch long, 5/8-inch diameter rebar with 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey
- 5/8-inch diameter rebar with 2-inch diameter aluminum cap inscribed "PLS 13002" found this survey
- 5/8-inch diameter rebar with 2-inch diameter aluminum cap inscribed "PLS 3831" found this survey
- 5/8-inch diameter rebar with 2-inch diameter aluminum cap with illegible markings found this survey
- 5/8-inch diameter rebar found this survey
- 2.5-inch diameter metal pipe with 3.25-inch diameter brass cap inscribed with appropriate details found this survey

Subject Property Boundary

Adjoining Property Boundary

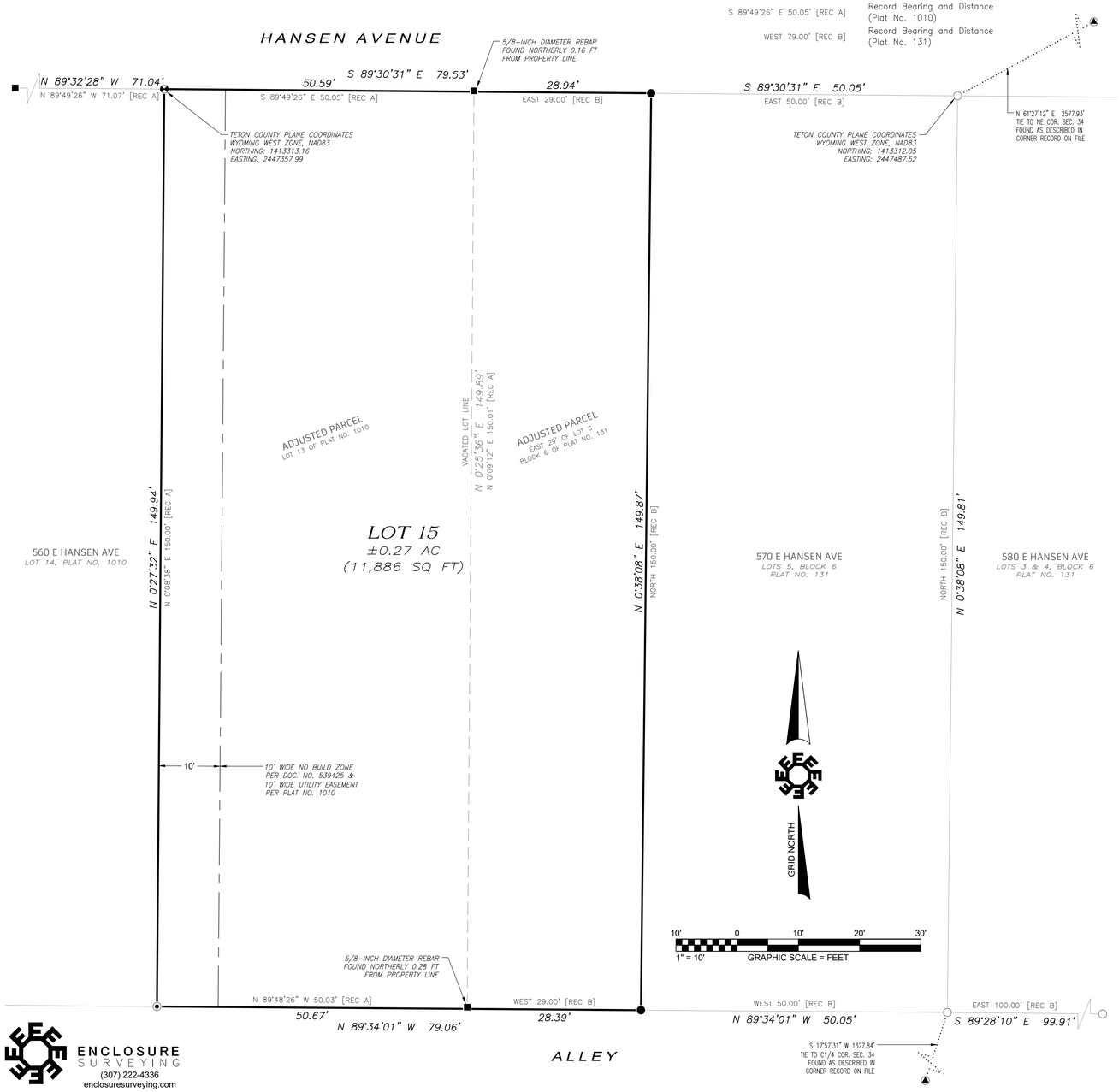
Vacated Property Boundary

Easement Line

N 89°30'31" W 50.00' — Measured Bearing and Distance

S 89°49'26" E 50.05' [REC A] — Record Bearing and Distance (Plat No. 1010)

WEST 79.00' [REC B] — Record Bearing and Distance (Plat No. 131)



ENCLOSURE SURVEYING
(307) 222-4336
enclosuresurveying.com

ENC\2025\25002-Jannotta\Survey\ACAD\25002_250709_PLAT.dwg

CERTIFICATE OF OWNERS

State of Wyoming)
County of Teton))) ss
Town of Jackson)

The undersigned owners and proprietors hereby certify;

that the foregoing subdivision of land shown hereon and described in the Certificate of Surveyor is with their free consent and in accordance with their desires;

that the name of the subdivision shall be The JOHN D. HALL EIGHTH ADDITION THE TOWN OF JACKSON;

that access to the subdivision is from East Hansen Avenue and adjacent alley;

that Lot 15 of this subdivision is subject to that 10 foot wide utility easement according to Plat No. 1010 recorded in the Office of the Clerk of Teton County;

that Lot 15 of this subdivision is subject to terms and conditions including that 10 foot wide No Build Zone according to Document No. 0539425 recorded in said Office;

that Lot 15 of this subdivision is subject to that Planning Director Affidavit Affecting Title recorded in said Office concurrently with this Plat;

that this subdivision is subject to all matters delineated on the John D. Hall Seventh Addition to the Town of Jackson, recorded as Plat No. 1010, and the John D. Hall Addition to the Town of Jackson, recorded as Plat No. 131;

that the undersigned owners do not warrant to any purchaser of a lot within this subdivision that they shall have any rights to the natural flow of any stream within or adjacent to the subdivision;

that Wyoming law does not recognize any riparian rights to the continued natural flow of a stream or river to persons living on the bank of the stream or river;

that all rights under and by virtue of the Homestead Exemption Laws of the State of Wyoming are hereby waived and released;

that this subdivision may be encumbered by or benefit from easements, rights-of-way. covenants, conditions, restrictions, and reservations of sight or record not limited to those shown hereon;

that Lot 13 of the John D. Hall Seventh Addition to the Town of Jackson, and the east 29 feet of Lot 6, Block 6, of the John D. Hall Addition to the Town of Jackson, recorded as Plat No. 1010, and Plat No. 131 respectively, in said Office are hereby vacated in accordance with the Town of Jackson Land Development Regulations, Article VII, Division 7.2 and Sections 34-12-106 through 110, Wyoming Statutes, as amended, being reconfigured as the JOHN D. HALL EIGHTH ADDITION TO THE TOWN OF JACKSON;

that the Teton County Clerk is respectfully requested to write "vacated" across Lot 13 of the John D. Hall Seventh addition to the Town of Jackson, Plat No. 1010 and the east 29 feet of Lot 6, Block 6, of the John D. Hall Addition to the Town of Jackson, Plat No. 131;

OWNER SIGNATURE BY SEPARATE AFFIDAVIT

Edgar D. Jannotta Jr., Trustee of the Jannotta 2007 Jackson Split Purchase QPRT dated October 16, 2007, and any amendments thereto

And

East Hansen Properties, LLC

CERTIFICATE OF SURVEYOR

State of Wyoming)
)) ss
County of Teton)

I, Mark Fellermann, of Jackson, Wyoming, hereby certify to the best of my knowledge and belief that this plat was prepared from the notes and data of a survey conducted by me or under my direct supervision, and from records on file with the Office of the Clerk of Teton County, Wyoming, and that it correctly represents the final plat of the JOHN D. HALL EIGHTH ADDITION TO THE TOWN OF JACKSON, identical to Lot 13 of the John D. Hall Seventh Addition to the Town of Jackson, the east 29 feet of Lot 6, Block 6, of the John D. Hall Addition to the Town of Jackson, recorded as Plat No. 1010 and Plat No. 131, respectively, in the Office of the Clerk of Teton County, Wyoming, being more particularly described as follows;

BEGINNING at the northeast corner of Lot 14 of said Plat No. 1010, said corner being marked by a 5/8-inch diameter rebar with 2-inch diameter aluminum cap with illegible markings found this survey;
THENCE S 89°30'31" E, 79.53 feet, to the northwest corner of Lot 5, Block 6, of said Plat No. 131, as marked by a 24-inch long, 5/8-inch diameter rebar with 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;
THENCE S 0°38'08" W, 149.87 Feet, to the southwest corner of said Lot 5, as marked by a 24-inch long, 5/8-inch diameter rebar with 2-inch diameter aluminum cap inscribed "PLS 16012" set this survey;
THENCE N 89°34'01" W, 79.06 feet, to the southeast corner of the aforementioned Lot 14, as marked by a 5/8-inch diameter rebar with 2-inch diameter aluminum cap inscribed "PLS 3831" found this survey;
THENCE N 0°27'32" E, 149.94 feet, along the east line of said Lot 14 to the POINT OF BEGINNING.

Said parcel encompasses an area of 0.27 acres (11,886 Square Feet), more or less.

The basis of bearings for this survey is referenced to a direct GPS measurement resulting in a bearing of N 0°27'32" E measured along the west line of Lot 15 as shown hereon.

_____
Mark Fellermann
Wyoming PLS License No. 16012

ACKNOWLEDGEMENT

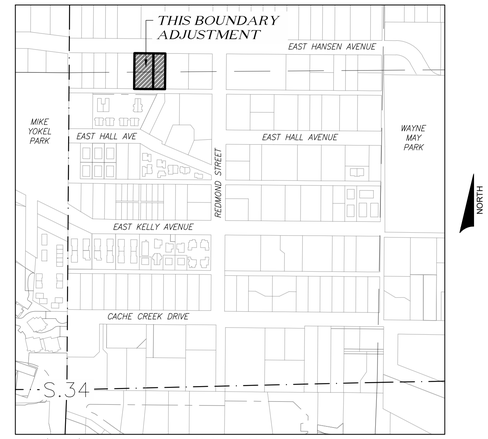
The foregoing instrument was acknowledged before me by Mark Fellermann on this _____ day of _____, 20___

Witness my hand and official seal.

_____
Notary Public My commission expires:

VICINITY MAP

SCALE: 1" = 300'



SW1/4NE1/4 OF SECTION 34, T. 41 N., R. 116 W., 6TH P.M. TETON COUNTY, WY

CERTIFICATE OF APPROVAL

State of Wyoming)
County of Teton))) ss
Town of Jackson)

The foregoing JOHN D. HALL EIGHTH ADDITION TO THE TOWN OF JACKSON was approved at the regular meeting of the Jackson Town Council held this _____ day of _____, 20___, in accordance with Section 15-1-415, Wyoming Statutes, as amended, and the relevant Town of Jackson Land Development Regulations.

TOWN OF JACKSON, WYOMING by:

_____
Arne Jorgensen
Mayor

_____
Riley Hovorka
Town Clerk

_____
Paul Anthony
Town Planning Director

_____
Brian Lenz
Town Engineer

ACKNOWLEDGEMENTS

The foregoing instrument was acknowledged before me by Arne Jorgensen (Mayor) on this _____ day of _____, 20___

Witness my hand and official seal.

_____
Notary Public
My commission expires:

The foregoing instrument was acknowledged before me by Brian Lenz (Town Engineer) on this _____ day of _____, 20___

Witness my hand and official seal.

_____
Notary Public
My commission expires:

The foregoing instrument was acknowledged before me by Paul Anthony (Town Planning Director) on this _____ day of _____, 20___

Witness my hand and official seal.

_____
Notary Public
My commission expires:

The foregoing instrument was acknowledged before me by Riley Hovorka (Town Clerk) on this _____ day of _____, 20___

Witness my hand and official seal.

_____
Notary Public
My commission expires:

FINAL PLAT
JOHN D. HALL EIGHTH ADDITION TO THE TOWN OF JACKSON

Being identical to
LOT 13, PLAT NO. 1010 &
THE EAST 29 FEET OF LOT 6
BLOCK 6, PLAT NO. 131
Located within the
W1/2NE1/4 OF SECTION 34
T. 41 N., R. 116 W., 6TH P.M.
Teton County, Wyoming

STAFF REPORT

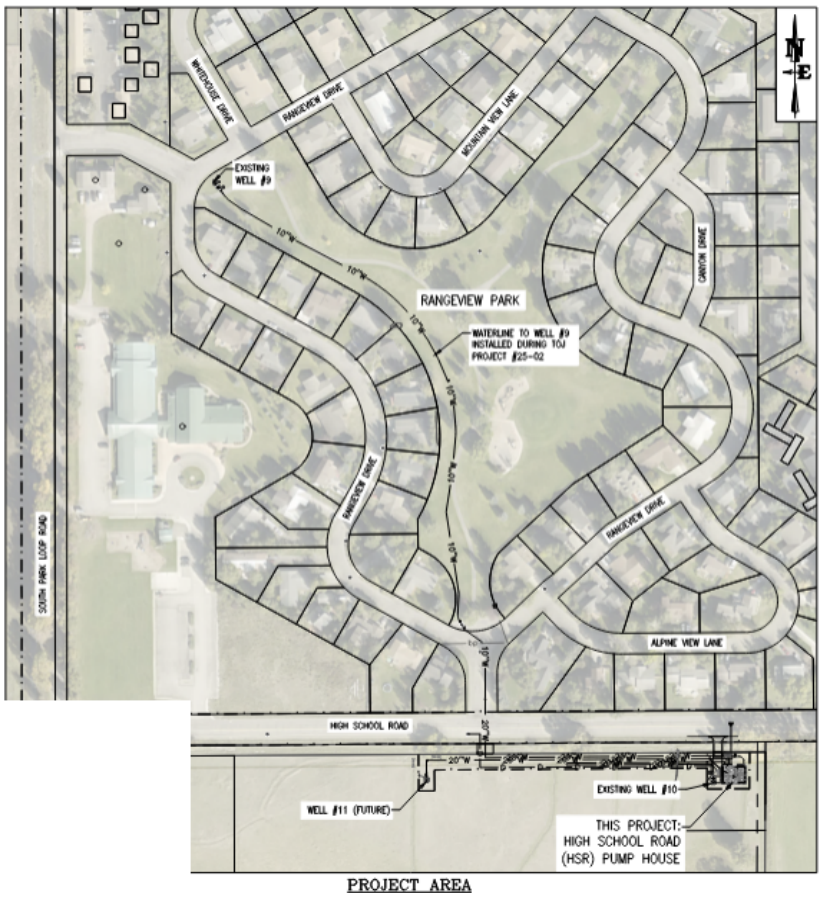
Meeting Date:	October 20, 2025	**Meeting Title:**	Town Council Regular
Submitting Department:	Public Works	**Presenter:**	Brian Lenz
Agenda Item:	Bid 26-06: 2025 High School Road Pump House Project	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is to 1) award Bid 26-06 to West Fork Construction, LLC, 2) for the Council to review and approve a contract with West Fork Construction, LLC, in the amount of $3,193,557.20 for the High School Road Pump House Project (Project), and 3) approve the overall project budget, in the amount of $3,778,557.20 and associated budget amendments.

Requested Action.
Staff request the Council award the Bid and approve the associated contract and approve the overall project budget.

Recommendations.
Staff recommend awarding the Bid and approving the associated contract and approving the overall project budget and associated budget amendments.

Background.
The proposed Project generally consists of construction of a new 1300 square feet Well Pumphouse on High School Road within an easement on the Porter Ranch. This is a critical phase in a multiphase project to increase the water supply in the Town's western supply zone. The Project is scheduled to commence as soon as possible and be operational in the spring of 2026. The Project will involve construction during the winter months. New Wells 9 and 10 will be completed and connected to the pumphouse as part of the Project. Once complete the facility will be able to supply water to the western supply zone (Zone 3) and provide redundancy to the existing Ely Springs supply (Wells 6, 7, & 8).
The West Jackson Water Supply Project is a multiphase multimillion dollar project that has been ongoing since 2020 when the Town applied for a grant to build a storage tank in Zone 3. The outcome of the application was that the state advised the Town to construct additional supply (wells) first that would allow for a smaller tank to be constructed later. Since that time, the Town has



PROJECT AREA

completed or is in the process of completing the work in phases as budget has allowed. Earlier phases of the new supply include: Well 9 construction in Rangeview Park, a Well Agreement with the Gill Family, Well 10 Construction within our easement on the Gill property, and the West Jackson Water Transmission Project to connect Wells 9 & 10. . This Project is the next phase to be completed. The future and final phases of the Project will culminate with construction of Well 11 and its connection to the High School Road Pumphouse and a new water tank in the zone.

Analysis & Key Policy Questions.

The Project was advertised for bid in the Jackson Hole News & Guide on August 20 and 27 and September 3rd, as well as posted on the Town's Website, and QuestCDN (an online bidding site). A mandatory pre-bid meeting was held on September 9th, that was attended by four general contractors, thus making them eligible to bid on the project. On September 25, 2025, the Town publicly opened the bid for construction of the project. Only one bid was received.

CONTRACTOR	BID AMOUNT
West Fork Construction, LLC (Wyoming)	$3,193,557.20

Staff has worked with this contractor on previous projects, they regularly perform this type of work for municipalities and the National Park Service. Staff is comfortable recommending awarding the one bid received.

The West Jackson Water Transmission Project work completed to date as described above cannot be put into operation without the proposed pump house being completed.

Due to the cost of the bid being higher than estimated during budgeting, the funding estimated in the FY26 Budget for the West Jackson Water Supply project is not adequate to fund the project. Staff have documented costs for the project and proposed funding in the Fiscal Impact portion of the Staff Report below.

Time is of the essence for this project to be completed and operational in time for next summer's irrigation season. While the preferred path would be to modify the bid prior to award we are recommending awarding the bid as is for efficiency and amending the contract through change orders where redesign and materials can be properly handled.

Staff recommend appropriating funding as outlined in the Fiscal Impact section and awarding the contract as bid and directing staff to collaborate with the contractor to find savings where possible.

- **KEY QUESTION**: Does the Council agree with staff's recommendation to award the Project and appropriate the overall project budget for the High School Road Pump House Project?

Possible Alternatives.

Possible alternatives for this item include:

1) The Council could reject the bid and rebid the project at a later date, which would delay the start and in turn completion of the project. Additionally, there are no guarantees that a future bid would less expensive and possibly could be more expensive after bids are received
2) Other

Comprehensive Plan & Priority Alignment.

This project supports the Comprehensive Plan and helps to fulfill the goal of providing and maintaining municipal services necessary to support the residential, business, environmental, and historical interests that define our community. Our services enhance the quality of life for those who live here and enhance the experience for our guests.

Fiscal Impact.

The fiscal impact of this project is broken down into the following three components:

1. The allocated funding in the current FY26 Budget
2. The total project cost for the High School Road Pumphouse Project
3. The amended FY26 Budget to cover the total project cost

1. Appropriated FY26 Funding as Amended

The FY26 Budget as amended appropriates funding as summarized below:

FY26 FUNDING FOR WEST JACKSON WATER		
Well #10	$	1,575,000.00
Use West Jackson Water Transmission Balance	$	510,745.00
TOTAL WATER FUNDING	**$**	**2,085,745.00**

The funding sources are summarized below:

- Well #10: This is funding Council appropriated in the FY26 budget for the completion of the pump house.
- West Jackson Water Transmission Balance: This is funding that Council appropriated in the FY25 budget for the West Jackson Water Transmission Project. These funds are the unused balance of funds from the Project.

2. Total Project Costs for the Project

The total project cost includes (1) the overall cost to construct the Project in included in the bid amount and (2) all additional costs to complete the Project, outside the bid amount. The reason the total project cost is higher than the bid received is because these costs are outside, not included, in the bid and are with different contractors, consultants, or utilities. The total project cost assumes the cost for the entire fiscal responsibility of the Project, which involves expenses associated with the construction contract. The total project cost includes the following:

TOTAL PROJECT COSTS		
Bid for Pumphouse Construction		
High School Road Pumphouse - West Fork Bid	$	3,193,557.20
Outside the bid Costs		
HSR Controls and Process Equipment - CST	$	325,000.00
HSR Pumphouse Construction Admin	$	175,000.00
LVE Power	$	85,000.00
TOTAL PROJECT COSTS	**$**	**3,778,557.20**

The following describes each cost in more detail:

- High School Road (HSR) Pumphouse – West Fork Bid: This cost is the cost of the bid recommended for award in this staff report and is directly related to the construction of the pumphouse.
- HSR Controls and Process Equipment – CST: This cost is associated with the equipment and labor provided by the Town's controls contractor, CST. CST is based out of Idaho and helps the Town with controls for all our water and wastewater utilities. Their work includes providing much of the equipment within the pumphouse, e.g. Programmable Logic Controller (PLC), Variable Frequency Drives (VFDs), treatment pumps, etc., that will allow the pumphouse to function and communicate with our SCADA

controls system. Because this is the Town's contractor and their specialty, this work is not included in the contract for the pumphouse.

- HSR Pumphouse Construction Admin: This cost is for work completed by Nelson Engineering, our engineering consultant to administer the construction of the pumphouse for the Town. Administration includes items like, contract documents, field inspections, survey, testing, weekly meetings with contractor, submittal review, operations checks, etc. They were also the design engineer for the Project.
- LVE Power: These costs are associated with the cost to provide a new power service to the pumphouse from their distribution grid. These costs include equipment, transformers, wires, and meters. West Fork will provide the support for trenching, concrete pads, etc. to complete the work.

3. The Amended FY26 Budget to Cover Total Project Costs

Due to the shortfall in budgeted funds relative to Total Project Costs, staff recommend the following amendments from the noted sources to the FY26 budget:

FY26 FUNDING FOR Well #10 / WEST JACKSON WATER		
West Jackson Water Supply	$	1,575,000.00
Use West Jackson Water Transmission Balance	$	510,745.00
TOTAL	$	2,085,745.00
FY26 AMENDED FUNDING		
Transfer from Snow King Dr Line & Pump	$	725,000.00
5th Cent Capital Loan Repay to Water Fund	**$**	**370,000.00**
Use of Water Fund Balance	**$**	**600,000.00**
Other	$	-
TOTAL	$	1,695,000.00
TOTAL WATER FUNDING	**$ 3,780,745.00**	

- Transfer from Snow King Dr Line & Pump: This is funding that Council appropriated in the FY26 budget for the construction of a new water main and booster pump station to supply the Snow King Estates water tank, in the amount of $810,000. Staff recommends reducing this funding to $85,000 for design work and updated cost estimates only and transferring the balance of the funding to this Project. Construction of this project would be considered as part of a future budget along with the 5 year Capital Improvement Plan.
- 5th Cent Capital Loan Repayment to Water Fund: From time to time the Town loans itself money from one fund to another to cover unfunded costs. When the Town constructed the Core Facilities building it used internal loans from the water and sewer enterprise funds to fully fund the project. The Capital Fund has since been replenished to the extent that it can repay its water loan, thus increasing the Water Fund balance to fund the Project.
- Use of Water Fund Balance: When Council approves the budget for the Water Fund, it approves costs less than the total available funds. The balance of the funds is commonly referred to as the reserves. The minimum for the reserve is six months of the Water Operation and Maintenance budget, about $850,000 in FY26. Budgeted reserves for FY26 are $1,444,640. This portion of the Project funding would utilize funds from the difference between minimum and budget.

Staff Impact.

Approximately 80 hours of staff time coordinating with engineers and contractors. Approximately 12 hours of staff time for drafting the staff report. The Legal Department will have approximately 2-4 hours of contract review.

During construction, some coordination between the Contractor and Engineering staff will be necessary. It is estimated that 10 to 20 hours/week of Public Works staff time will be required.

Stakeholders include property owners adjacent the Project, the public, and staff who maintain and operate the water system.

Attachments or Links.

1. Bid 26-06 - Westfork Bid.
2. 26-06 Construction Contract

Suggested Motion.

I move to:

1. Direct staff to award the bid to West Fork Construction, LLC for the West Jackson Water Transmission Project in the amount of $3,193,557.20;
2. Approve the 26-06 Construction Contract with West Fork Construction, LLC for the West Jackson Water Transmission Project, subject to minor changes by staff
3. Approve the overall West Jackson Water Transmission Project, including amendments to the FY26 budget as described herein with the next budget resolution.

West Fork Construction LLC
PO Box 10021
Jackson, WY 83002

Proposal

Project: 2025 HIGH SCHOOL ROAD PUMP HOUSE

TOJ PROJECT #: 26-06

Submitted By: West Fork Construction

West Fork Construction LLC
PO Box 10021
Jackson, WY 83002

Table of Contents

I. Bid Form……3-10
II. Bid Bond……11-13
III. Qualification Statement……14-18
a. OSHA 300 Forms……19-21
b. Financial Statement……22-24
IV. Subcontractor List……25
V. Rate Sheet……26
VI. Business License……27
VII. Wyoming Resident Contractor Certificate……28
VIII. Contractors License……29-30

BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

Town of Jackson
P.O. Box 1687
150 East Pearl Avenue
Jackson, Wyoming 83001
TownClerk@jacksonwy.gov

Town of Jackson Project Number 26-06

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid Security;

B. Bidder's Qualifications

C. List of Proposed Subcontractors;

D. List of Proposed Suppliers;

E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids; Acceptable documentation is a statement of good standing from the Wyoming Secretary of State's office. For residency, include your Wyoming Resident Contractor Certificate of Residency from the Wyoming Department of Workforce Services.; and

F. Contractor's license number as evidence of Bidder's State Contractor's License, Class B in accordance with Teton County, WY. or a covenant by Bidder to obtain said license within the time for acceptance of Bids

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 Unit Price Bids

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s) and indicated unit prices. The following bid schedule is the total of respective schedules.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

BID SCHEDULE

2025 HIGH SCHOOL ROAD PUMP HOUSE

BASE BID

ITEM	* Construction Item		Quantity	Unit	Unit Price	Total
1	Mobilization (10% of Bid Price Maximum)		1	LS	343,524.00	343,524.00
2	Force Account (Owner's Contingency)		T&M	-	$155,000.00	$155,000
3	Well 9 Completion					
	3.01	Pump, Motor & Elec. Cable to Disconnect	LS	1	143,703.00	143,703.00
	3.02	Column Pipe & Check Valve	LS	1	33,403.00	33,403.00
	3.03	** Install Pressure Transducer	LS	1	4,320.00	4,320.00
	3.04	Electrical Pedestal and Well Disconnect	LS	1	28,968.00	28,968.00
4	Well 10 Completion					
	4.01	Pump, Motor & Elec. Cable to Disconnect	LS	1	143,702.00	143,702.00
	4.02	Column Pipe & Check Valve	LS	1	33,403.00	33,403.00
	4.03	** Install Pressure Transducer	LS	1	4,320.00	4,320.00
	4.04	Chemical (Chlor. & Phos.) Drop Pipes	LS	1	1,680.00	1,680.00
	4.05	Electrical Pedestal and Well Disconnect	LS	1	28,397.00	28,397.00
5	Pump House Building					
	5.01	Excavation & Backfill	LS	1	115,368.00	115,368.00
	5.02	Concrete Foundation	LS	1	33,660.00	33,660.00
	5.03	Sanitary Waste/Floor Drain System, Manhole & Pump	LS	1	13,980.00	13,980.00
	5.04	Concrete Slab	LS	1	20,280.00	20,280.00
	5.05	Wall & Roof Framing	LS	1	99,000.00	99,000.00
	5.06	Roof, Fascia and Soffit	LS	1	109,881.00	109,881.00
	5.07	Man Doors & Windows	LS	1	27,238.00	27,238.00
	5.08	Roll Up Doors	EA	3	29,512.00	88,535.00
	5.09	Siding & Trim	LS	1	95,209.00	95,209.00
	5.10	Building Paint & Finishes	LS	1	17,280.00	17,280.00
6	Building Process Piping					
	6.01	10" Gate Valves	EA	3	4,920.00	14,760.00
	6.02	20" Gate Valves	EA	1	5,400.00	5,400.00
	6.03	10" Check Valves	EA	3	12,600.00	37,800.00
	6.04	20" Gate Valves	EA	1	12,600.00	12,600.00
	6.05	** Install 10" Meters	EA	2	2,520.00	5,040.00
	6.06	Fire Suppression System	LS	1	55,783.00	55,783.00
	6.07	Mics. Pipe, Valves & Fittings	LS	1	59,040.00	59,040.00
7	Building HVAC					
	7.01	Unit Heaters	EA	4	6,478.00	21,592.00
	7.02	Exhaust Fans	EA	2	13,687.00	27,374.00
	7.03	Control & Disinfection Room Louvers	EA	2	13,400.00	26,800.00
	7.04	Generator Intake Louvers & Dampers	EA	4	11,160.00	53,597.00
	7.05	Generator Exhaust Louver	EA	1	14,966.00	14,966.00
	7.06	AC and Fan Coil Units	EA	3	20,743.00	62,230.00

SEE NEGOTIATED BID SCHEDULE

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ITEM	* Construction Item		Quantity	Unit	Unit Price	Total
8	Building & Site Electrical					
	8.01	Building Electrical Service (Transformer & Pad, CT, Meter, etc.)	LS	1	10,968.00	10,968.00
	8.02	Building Electrical, Panels & Transformers	LS	1	219,390.00	219,390.00
	8.03	** Installation of Well Filters & VFDs	EA	2	23,040.00	46,080.00
	8.04	** Installation of Well 9 Sinewave Filter	EA	1	4,576.00	4,576.00
	8.05	In-Ground Pull Boxes (Well 9 & 11)	EA	2	10,637.00	21,274.00
	8.06	Well Power Conduit Extension to Building	LF	150	25.20	3,780.00
	8.07	Well 9 Disconnect & 1850-LF of Conductors	LS	1	438,300.00	438,300.00
	8.08	Well 10 Disconnect & 45-LF of Conductors	LS	1	36,632.00	36,632.00
	8.09	Electrical & Controls for HVAC Systems	LS	1	25,296.00	25,296.00
	8.10	Building Electrical (RCPs) and Lighting	LS	1	7,800.00	7,800.00
	8.11	Generator Electrical Complete	LS	1	35,170.00	35,170.00
Add. #2	8.12	Install PLC Process Control Panel, Process Equipment, Conduits & Wiring	LS	1	79,075.00	79,075.00
Add. #2	8.13	Fire Alarm System Electrical	LS	1	30,814.00	30,814.00
9	Standby Generator					
	9.01	Diesel Generator	LS	1	134,310.00	134,310.00
	9.02	Automatic Transfer Switch	LS	1	33,585.00	33,585.00
	9.03	Air Cooling System	LS	1	10,493.00	10,493.00
	9.04	Day Tank and Fill Station	LS	1	47,600.00	47,600.00
	9.05	Miscellaneous	LS	1	31,592.00	31,592.00
10	Chlorine Disinfection System					
	10.01	System Water Supply Plumbing	LS	1	22,800.00	22,800.00
	10.02	Well 9 Chemical Booster Pump	LS	1	14,400.00	14,400.00
	10.03	** Install Solenoid Valves and Injectors	EA	2	6,000.00	12,000.00
	10.04	System Chemical Discharge Plumbing	LS	1	10,200.00	10,200.00
11	Orthophosphate System					
	11.01	System Water Supply Plumbing	LS	1	22,800.00	22,800.00
	11.02	** Install Chemical Metering Pumps	EA	2	4,800.00	9,600.00
	11.03	Metering Pump Stand	LS	1	1,680.00	1,680.00
	11.04	Chemical Storage Tank & Feed Plumbing	LS	1	6,240.00	6,240.00
	11.05	Well 9 Chemical Booster Pump	LS	1	14,400.00	14,400.00
	11.06	System Chemical Discharge Plumbing	LS	1	10,200.00	10,200.00
12	Site Improvements					
	12.01	Concrete Aprons	SF	130	109.00	14,170.00
	12.02	Adjust MH Lids & Valve Collars	EA	8	420.00	3,360.00
	12.03	Paved Driveway & Parking	SF	2320	16.17	37,514.00
	12.04	Post, Rail & Wire Fence	LF	250	131.00	32,750.00
	12.05	Access Gate	LS	1	1,980.00	1,980.00

SEE NEGOTIATED BID SCHEDULE

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ITEM	* Construction Item		Quantity	Unit	Unit Price	Total
13	Irrigation & Landscaping					
	13.01	Topsoil & Meadow Sod	SF	2420	5.54	13,417.00
	13.02	Topsoil & Hydroseed	SF	8900	2.70	24,030.00
	13.03	Colorado Spruce (14')	EA	1	4,104.00	4,104.00
	13.04	Colorado Spruce (1[illegible])	EA	1	5,674.00	5,674.00
	13.05	Aspen	EA	3	3,024.00	9,072.00
	13.06	Dogwood	EA	5	2,520.00	12,600.00
	13.07	Willow	EA	20	1,170.00	23,400.00
	13.08	Irrigation System	LS	1	9,506.00	9,506.00
BID TOTAL (use numbers)						**$3,470,465.00**

SEE NEGOTIATED BID SCHEDULE

*See Section 01 27 00 - "Measurement & Payment Procedures" for method of measurement and payment for each bid item. The Bid Schedule listed above shall not be considered comprehensive in nature, where items identified in the drawings and specifications that are required for completion of the work may not be completely identified. Items not completely identified shall be included in the prices bid for various contract/bid items and no additional compensation will be allowed.

** "Install", or "installation", described in this Bid Schedule, shall imply that equipment is furnished by Owner and installed by Contractor.

B. Bidder acknowledges that:

1. Each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and

2. Estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3. The Bid Schedule is provided for convenience and shall not be construed as exhaustive or all-inclusive. The Contractor is responsible for reviewing all drawings, specifications, and contract documents in their entirety. Any materials, equipment, labor, or services required to complete the Work in accordance with the Contract Documents, whether or not specifically itemized in the Bid Schedule, shall be deemed included in the Contractor's bid prices for the applicable line items. No additional compensation shall be due for any such items, and the Contractor shall not be entitled to a change order or claim for compensation based on the omission of any required item from the Bid Schedule.

ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 Bid Acceptance Period

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

period of time that Bidder may agree to in writing upon request of Owner.

5.02 Instructions to Bidders

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 Receipt of Addenda

A. Bidder acknowledges receipt of the Addenda following the Bid Schedule.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 Bidder's Representations

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 Bidder's Certifications

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:
    a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.
    b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.
    c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.
    d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

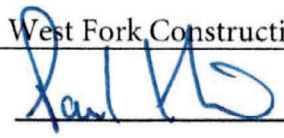
REMAINDER OF PAGE LEFT BLANK INTENTIONALLY

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

BIDDER hereby submits this Bid as set forth above:

Bidder:

West Fork Construction LLC
(typed or printed name of organization)

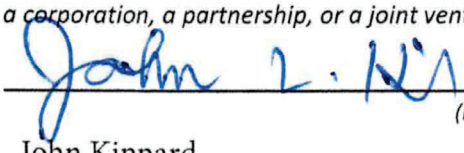
By: 
(individual's signature)

Name: Paul Kinnard
(typed or printed)

Title: Managing Partner
(typed or printed)

Date: 09/25/2025
(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: 
(individual's signature)

Name: John Kinnard
(typed or printed)

Title: Managing Partner
(typed or printed)

Date: 09/25/2025
(typed or printed)

Address for giving notices:
PO Box 10021
Jackson, WY 83001

Bidder's Contact:

Name: Paul Kinnard
(typed or printed)

Title: Managing Partner
(typed or printed)

Phone: 307-413-1736

Email: paul@westforkcc.com

Address:
West Fork Construction LLC
PO Box 10021
Jackson, WY 83001

Bidder's Contractor License No.: (if applicable) COQ-25-0200

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Bidder hereby acknowledges receipt of the following Addenda

Addendum Number	Addendum Date
1	9/19/25
2	9/23/25

2025 HIGH SCHOOL ROAD PUMP HOUSE

jk
23-302
10/10/2025

Project: 2025 HSR Pump House Project
Project #: 26-06
Bid Date: 10/8/2025
Location: Town of Jackson, Town Hall, 150 East Pearl Avenue, Jackson, WY 83001
TOJ: Brian Lenz, Ish Jimenez, Jeff Silliman

Contractor	**Westfork Construction**
Proof of WY Residency	YES
Addendum(s) Acknowledged	YES
Bid Bond Included	YES

BASE BID

ITEM	* Construction Item		Unit	Quantity	Unit Price	Total
1	Mobilization (10% of Bid Price Maximum)		1	LS	$ 323,607.00	$ 323,607.00
2	Force Account (Owner's Contingency)		T&M	-	$ 80,000.00	$ 80,000.00
3	Well 9 Completion					
	3.01	Pump, Motor & Elec. Cable to Disconnect	LS	1	$ 113,702.00	$ 113,702.00
	3.02	Column Pipe & Check Valve	LS	1	$ 33,403.00	$ 33,403.00
	3.03	** Install Pressure Transducer	LS	1	$ 4,320.00	$ 4,320.00
	3.04	Electrical Pedestal and Well Disconnect	LS	1	$ 24,768.00	$ 24,768.00
4	Well 10 Completion					
	4.01	Pump, Motor & Elec. Cable to Disconnect	LS	1	$ 113,702.00	$ 113,702.00
	4.02	Column Pipe & Check Valve	LS	1	$ 33,403.00	$ 33,403.00
	4.03	** Install Pressure Transducer	LS	1	$ 4,320.00	$ 4,320.00
	4.04	Chemical (Chlor. & Phos.) Drop Pipes	LS	1	$ 1,680.00	$ 1,680.00
	4.05	Electrical Pedestal and Well Disconnect	LS	1	$ 24,197.00	$ 24,197.00
5	Pump House Building					
	5.01	Excavation & Backfill	LS	1	$ 115,368.00	$ 115,368.00
	5.02	Concrete Foundation	LS	1	$ 33,660.00	$ 33,660.00
	5.03	Sanitary Waste/Floor Drain System, Manhole & Pump	LS	1	$ 13,980.00	$ 13,980.00
	5.04	Concrete Slab	LS	1	$ 20,280.00	$ 20,280.00
	5.05	Wall & Roof Framing	LS	1	$ 99,000.00	$ 99,000.00
	5.06	Roof, Facia and Soffit	LS	1	$ 109,881.00	$ 109,881.00
	5.07	Man Doors & Windows	LS	1	$ 27,238.00	$ 27,238.00
	5.08	Roll Up Doors	EA	3	$ 29,512.00	$ 88,536.00
	5.09	Siding & Trim	LS	1	$ 95,209.00	$ 95,209.00
	5.10	Building Paint & Finishes	LS	1	$ 17,280.00	$ 17,280.00
6	Building Process Piping					
	6.01	10" Gate Valves	EA	3	$ 4,920.00	$ 14,760.00
	6.02	20" Gate Valves	EA	1	$ 5,400.00	$ 5,400.00
	6.03	10" Check Valves	EA	3	$ 12,600.00	$ 37,800.00
	6.04	20" Gate Valves	EA	1	$ 12,600.00	$ 12,600.00
	6.05	** Install 10" Meters	EA	2	$ 2,520.00	$ 5,040.00
	6.06	Fire Suppression System	LS	1	$ 55,783.00	$ 55,783.00
	6.07	Mics. Pipe, Valves & Fittings	LS	1	$ 59,040.00	$ 59,040.00
7	Building HVAC					
	7.01	Unit Heaters	EA	4	$ 6,478.00	$ 25,912.00
	7.02	Exhaust Fans	EA	2	$ 13,687.00	$ 27,374.00
	7.03	Control & Disinfection Room Louvers	EA	2	$ 13,399.00	$ 26,798.00
	7.04	Generator Intake Louvers & Dampers	EA	4	$ 13,399.00	$ 53,596.00
	7.05	Generator Exhaust Louver	EA	1	$ 14,966.00	$ 14,966.00
	7.06	AC and Fan Coil Units	EA	3	$ 20,743.00	$ 62,229.00
8	Building & Site Electrical					
	8.01	Building Electrical Service (Transformer & Pad, CT, Meter, etc.)	LS	1	$ 10,968.00	$ 10,968.00
	8.02	Building Electrical, Panels & Transformers	LS	1	$ 188,590.00	$ 188,590.00
	8.03	** Installation of Well Filters & VFDs	EA	2	$ 18,240.00	$ 36,480.00
	8.04	** Installation of Well 9 Sinewave Filter	EA	1	$ 4,576.00	$ 4,576.00
	8.05	In-Ground Pull Boxes (Well 9 & 11)	EA	2	$ 8,040.00	$ 16,080.00
	8.06	Well Power Conduit Extension to Building	LF	150	$ 25.20	$ 3,780.00
	8.07	Well 9 Disconnect & 1850-LF of Conductors	LS	1	$ 366,294.00	$ 366,294.00
	8.08	Well 10 Disconnect & 45-LF of Conductors	LS	1	$ 27,582.00	$ 27,582.00
	8.09	Electrical & Controls for HVAC Systems	LS	1	$ 25,296.00	$ 25,296.00
	8.10	Building Electrical (RCPs) and Lighting	LS	1	$ 38,400.00	$ 38,400.00
	8.11	Generator Electrical Complete	LS	1	$ 35,170.00	$ 35,170.00
	8.12	Install PLC Process Control Panel, Process Equipment, Conduits & Wiring	LS	1	$ 55,075.00	$ 55,075.00
	8.13	Fire Alarm System Electrical	LS	1	$ 20,028.00	$ 20,028.00
9	Standby Generator					
	9.01	Diesel Generator	LS	1	$ 147,311.00	$ 147,311.00

Nelson Engineering
Jackson, Wyoming

2025 HIGH SCHOOL ROAD PUMP HOUSE

	9.02	Automatic Transfer Switch	LS	1	$ 33,585.00	$ 33,585.00
	9.03	Air Cooling System	LS	1	$ 10,493.00	$ 10,493.00
	9.04	Day Tank and Fill Station	LS	1	$ 47,600.00	$ 47,600.00
	9.05	Muffler	LS	1	$ 31,592.00	$ 31,592.00
10	Chlorine Disinfection System					
	10.01	System Water Supply Plumbing	LS	1	$ 22,800.00	$ 22,800.00
	10.02	Well 9 Chemical Booster Pump	LS	1	$ 14,400.00	$ 14,400.00
	10.03	** Install Solenoid Valves and Injectors	EA	2	$ 6,000.00	$ 12,000.00
	10.04	System Chemical Discharge Plumbing	LS	1	$ 10,200.00	$ 10,200.00
11	Orthophosphate System					
	11.01	System Water Supply Plumbing	LS	1	$ 22,800.00	$ 22,800.00
	11.02	** Install Chemical Metering Pumps	EA	2	$ 4,800.00	$ 9,600.00
	11.03	Metering Pump Stand	LS	1	$ 1,680.00	$ 1,680.00
	11.04	Chemical Storage Tank & Feed Plumbing	LS	1	$ 6,240.00	$ 6,240.00
	11.05	Well 9 Chemical Booster Pump	LS	1	$ 14,400.00	$ 14,400.00
	11.06	System Chemical Discharge Plumbing	LS	1	$ 10,200.00	$ 10,200.00
12	Site Improvements					
	12.01	Concrete Aprons	SF	130	$ 109.00	$ 14,170.00
	12.02	Adjust MH Lids & Valve Collars	EA	8	$ 420.00	$ 3,360.00
	12.03	Paved Driveway & Parking	SF	2320	$ 16.17	$ 37,514.40
	12.04	Post, Rail & Wire Fence	LF	250	$ 130.75	$ 32,688.00
	12.05	Access Gate	LS	1	$ 1,980.00	$ 1,980.00
13	Irrigation & Landscaping					
	13.01	Topsoil & Meadow Sod	SF	2420	$ 5.54	$ 13,406.80
	13.02	Topsoil & Hydroseed	SF	8900	$ 2.70	$ 24,030.00
	13.03	Colorado Spruce (14')	EA	1	$ 4,104.00	$ 4,104.00
	13.04	Colorado Spruce (16')	EA	1	$ 5,674.00	$ 5,674.00
	13.05	Aspen	EA	3	$ 3,024.00	$ 9,072.00
	13.06	Dogwood	EA	5	$ 2,520.00	$ 12,600.00
	13.07	Willow	EA	20	$ 1,170.00	$ 23,400.00
	13.08	Irrigation System	LS	1	$ 9,506.00	$ 9,506.00
BID TOTAL (use numbers)						**$ 3,193,557.20**

BID BOND (PENAL SUM FORM)

Bidder	**Surety**
Name: West Fork Construction, LLC Address *(principal place of business)*: 240 Hansen Avenue Jackson, WY 83001	Name: Philadelphia Indemnity Insurance Company Address *(principal place of business)*: One Bala Plaza, Suite 100 Bala Cynwyd, PA 19004-0950
Owner Name: **Town of Jackson, Wyoming** Address *(principal place of business)*: **P.O. Box 1687** **150 East Pearl Avenue** **Jackson, Wyoming 83001**	**Bid** Project *(name and location)*: **Town of Jackson** **2025 High School Road Pump House** Bid Due Date: **1:00 PM, 25 September 2025**

Bond

Penal Sum: Five Percent of Amount Bid (5%)

Date of Bond: September 25, 2025

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

Bidder	Surety
West Fork Construction, LLC *(Full formal name of Bidder)*	Philadelphia Indemnity Insurance Company *(Full formal name of Surety) (corporate seal)*
By: John L. Kinnard *(Signature)*	By: Wendy A Bright *(Signature) (Attach Power of Attorney)*
Name: John Kinnard *(Printed or typed)*	Name: Wendy A. Bright *(Printed or typed)*
Title: Managing Partner	Title: Attorney-in-Fact
Attest: Paul Kinnard *(Signature)*	Attest: Madeline Lovett *(Signature)*
Name: Paul Kinnard *(Printed or typed)*	Name: Madeline Lovett *(Printed or typed)*
Title: Managing Partner	Title: Witness

Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.

EJCDC® C-430, Bid Bond (Penal Sum Form).
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.

2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.

3. This obligation will be null and void if:

   3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or

   3.2. All Bids are rejected by Owner, or

   3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.

6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.

7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

Copyright® 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

PHILADELPHIA INDEMNITY INSURANCE COMPANY
One Bala Plaza, Suite 100
Bala Cynwyd, PA 19004-0950

Power of Attorney

KNOW ALL PERSONS BY THESE PRESENTS: That **PHILADELPHIA INDEMNITY INSURANCE COMPANY** (the Company), a corporation organized and existing under the laws of the Commonwealth of Pennsylvania, does hereby constitute and appoint **Barbara A. Leeper, Patti K. Lindsey, Wendy A. Bright, Pamela M. Anderson, William M. Chapman, Matthew M. Eperesi, Natasha Kerr, Madeline P. Lovett, Cheri L. Ritz, Giavonna D. Tavella, Gracie O. Lowden, Kailee M. Rousseau, Krista M. Nagy, and Nicholas A. Burke of Seubert and Associates, Inc.** its true and lawful Attorney-in-fact with full authority to execute on its behalf bonds, undertakings, recognizances and other contracts of indemnity and writings obligatory in the nature thereof, issued in the course of its business and to bind the Company thereby, in an amount not to exceed **$50,000,000.**

This Power of Attorney is granted and is signed and sealed by facsimile under and by the authority of the following Resolution adopted by the Board of Directors of PHILADELPHIA INDEMNITY INSURANCE COMPANY on the 14th of November 2016.

RESOLVED: That the Board of Directors hereby authorizes the President or any Vice President of the Company: (1) Appoint Attorney(s) in Fact and authorize the Attorney(s) in Fact to execute on behalf of the Company bonds and undertakings, contracts of indemnity and other writings obligatory in the nature thereof and to attach the seal of the Company thereto; and (2) to remove, at any time, any such Attorney-in-Fact and revoke the authority given. And, be it

FURTHER RESOLVED: That the signatures of such officers and the seal of the Company may be affixed to any such Power of Attorney or certificate relating thereto by facsimile, and any such Power of Attorney so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company in the future with respect to any bond or undertaking to which it is attached.

IN TESTIMONY WHEREOF, PHILADELPHIA INDEMNITY INSURANCE COMPANY HAS CAUSED THIS INSTRUMENT TO BE SIGNED AND ITS CORPORATE SEALTO BE AFFIXED BY ITS AUTHORIZED OFFICE THIS 5TH DAY OF OCTOBER 2024.

(Seal)

John Glomb, President & CEO
Philadelphia Indemnity Insurance Company

On this 5th day of October, 2024 before me came the individual who executed the preceding instrument, to me personally known, and being by me duly sworn said that he is the therein described and authorized officer of the **PHILADELPHIA INDEMNITY INSURANCE COMPANY**; that the seal affixed to said instrument is the Corporate seal of said Company; that the said Corporate Seal and his signature were duly affixed.

Commonwealth of Pennsylvania - Notary Seal
Vanessa Mckenzie, Notary Public
Delaware County
My commission expires November 3, 2028
Commission number 1366394
Member, Pennsylvania Association of Notaries

Notary Public: Vanessa McKenzie

residing at: Linwood, PA

My commission expires: November 3, 2028

I, Edward Sayago, Corporate Secretary of PHILADELPHIA INDEMNITY INSURANCE COMPANY, do hereby certify that the foregoing resolution of the Board of Directors and the Power of Attorney issued pursuant thereto on the 5th day October 2024 are true and correct and are still in full force and effect. I do further certify that John Glomb, who executed the Power of Attorney as President, was on the date of execution of the attached Power of Attorney the duly elected President of PHILADELPHIA INDEMNITY INSURANCE COMPANY.

In Testimony Whereof I have subscribed my name and affixed the facsimile seal of each Company this 25th day of September, 20 25 .

Edward Sayago, Corporate Secretary
PHILADELPHIA INDEMNITY INSURANCE COMPANY

Schedule A—Current Projects

Name of Organization	Hungry Horse Dam				
Project Owner	Bureau of Reclamation		Project Name	Hungry Horse Dam Water Conveyance System	
General Description of Project	Domestic water piping , pump install, and electrical upgrades				
Project Cost	$2,788,069.00		Date Project	2/1/25 to 12/1/25	
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name	John Kinnard	Chris Currier	Chris Currier	Chris Currier	
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager	Silas Biggin	Supervisory Civil Engineer	Bureau of Reclamation	(208) 270-8938	SBiggin@usbr.gov

Project Owner	Teton Village Association		Project Name	Mangy Moose Heated Sidewalks	
General Description of Project					
Project Cost	$1,171,652		Date Project	5/1/25 to 12/15/25	
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name	Paul Kinnard	Jordan Weyand	Chris Currier	Paul Kinnard	
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer	Josh Kilpatrick	Project Engineer	Nelson Engineering	(307)690-2086	jkilpatrick@nelsonengineering.net
Construction Manager	Rafe Cordell	Facilities Director	Teton Village Association	307-690-0769	tvafacilities@tetonvillagewy.gov

Project Owner	Glacier National Park		Project Name	Dorm 36 Rehabilitation	
General Description of Project	Deconstruction and reconstruction of historic dorm				
Project Cost	$1,535,700		Date Project	9/1/25 to 7/30/25	
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager	Kirby Granite	Civil Engineer	National Park Service	(406) 890-5893	kirby_granite@nps.gov

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Schedule B—Previous Experience with Similar Projects

Name of Organization	West Fork Construction LLC				
Project Owner	National Park Service		Project Name	Madison Junction Treatment System & Spring Collection System	
General Description of Project	Construction of a domestic water faciliy				
Project Cost	$841,581		Date Project	06/01/23 to 09/ 15/23	
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name	Paul Kinnard	Paul Kinnard	Chris Currier	Paul Kinnard	
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager	Katon Clayborn	PM - Prime Contractor	Bairco Construction	559-288-8332	katon@baircoconstruction.com

Project Owner	National Park Service		Project Name		
General Description of Project	Construction of a domestic water storage tank.				
Project Cost	$353,578		Date Project	9/15/20 to 12/15/20	
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name	Paul Kinnard	Paul Kinnard	Michael Lavin	Michael Lavin	
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner	Charlie Jahner	Facilities Manager	University of Wyoming	307-760-0815	Charliej@uwyo.edu
Designer					
Construction Manager					

Project Owner	City of Kalispell, MT		Project Name	Grandview Lift Station	
General Description of Project	Construction of a sewer system pump house and a30' deep wet well.				
Project Cost	$1,023,079		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name	Paul Kinnard	Chris Currier	Chris Currier	Chris Currier	
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer	Brad Koenig	Project Engineer	Robert Peccia & Associates	406-447-5000	bkoenig@rpa-hln.com
Construction Manager					

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Schedule B—Previous Experience with Similar Projects

Name of Organization	West Fork Construction LLC				
Project Owner	Teton County, Wyoming		Project Name	Jail Generator Replacement	
General Description of Project	Replace emergency generator and transfer switches				
Project Cost	$382,094		Date Project	10/1/2020 to 04/15/2020	
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name	John Kinnard	John Kinnard	John Kinnard	John Kinnard	
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner	Richard Kussy	Facilities Manager	Teton County	(307) 413-6642	rkussy@tetoncountywy.gov
Designer					
Construction Manager					

Project Owner	Wyoming Department of Transportation		Project Name	Teton Pass Salt & Sand Building	
General Description of Project	New build of highway department salt and sand buidling on Teton Pass				
Project Cost	$751,451		Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name	John Kinnard	John Kinnard	John Kinnard	Michael Lavin	
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner	Tyler Wille	Project Engineer	WYDOT	307-352-3046	tyler.wille@wyo.gov
Designer					
Construction Manager					

Project Owner	Jackson Hole Mountain Resort		Project Name	Snow Cat Garage	
General Description of Project	Maintenance garage at the top of Jackson Hole Mountain Resort				
Project Cost	$981,461		Date Project	6/1/23 to 9/1/23	
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name	John Kinnard	Jordan Weyand	John Kinnard	John Kinnard	
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner	JJ Markman	Facilities Director	JH Mountain Resort	307-739-2681	jj.markman@jacksonhole.com
Designer					
Construction Manager					

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Schedule C—Key Individuals

Project Manager			
Name of individual		JohnKinnard	
Years of experience as project manager		17	
Years of experience with this organization		9	
Number of similar projects as project manager		5	
Number of similar projects in other positions		1	
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Hungry Horse Dam Potable Water		30%	12/1/25
Glacier Dorm 36 Rehabilitation		30%	10/1/26
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name	Charlie Jahner	Name	JJ Markman
Title/Position	Facilities Manager	Title/Position	Facilities Director
Organization	University of Wyoming	Organization	JH Mountain Resort
Telephone	307-760-0815	Telephone	307-739-2681
Email	charliej@uwyo.edu	Email	jj.markman@jacksonhole.com
Project	AMK Ranch Seawall	Project	Snow Cat Garage
Candidate's role on project	Project Manager	Candidate's role on project	Project Manager

Project Superintendent			
Name of individual		Paul Kinnard	
Years of experience as project superintendent		22	
Years of experience with this organization		9	
Number of similar projects as project superintendent		5	
Number of similar projects in other positions		1	
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Mangy Moose Heated Sidewalks		30%	12/1/15
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name	Lori Spano	Name	Katon Clayborn
Title/Position	Facilities Manager	Title/Position	Project Manager
Organization	Vail Resorts	Organization	Bairco Consstruction
Telephone	307-699-4325	Telephone	559-288-8332
Email	lspano@vailresorts.com	Email	katon@baircoconstruction.com
Project	JLL Electrical Service	Project	Madison Junction Water System
Candidate's role on project	Project Manager	Candidate's role on project	Project Manager

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Safety Manager			
Name of individual		Chris Currier	
Years of experience as project manager		15	
Years of experience with this organization		3	
Number of similar projects as project manager		2	
Number of similar projects in other positions		0	
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Hungry Horse Potable Water System		50%	12/1/25
Swift Current Lift Station		30%	10/1/25
Preconstruction		20%	
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name	Kirby Granite	Name	
Title/Position	Civil Engineer	Title/Position	
Organization	National Park Service	Organization	
Telephone	406-890-5893	Telephone	
Email	kirby_granite@nps.gov	Email	
Project	Many Glacier Comfort Stations	Project	
Candidate's role on project	Safety Manager	Candidate's role on project	

Quality Control Manager			
Name of individual		Galen Parke	
Years of experience as project superintendent		18	
Years of experience with this organization		2	
Number of similar projects as project superintendent		10	
Number of similar projects in other positions		10	
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name	Charlier Jahner	Name	Phil Fessler
Title/Position	Facilities Manager	Title/Position	Project Manager
Organization	University of Wyoming	Organization	National Park Service
Telephone	307-760-0815	Telephone	307-250-1335
Email	Charliej@uwyo.edu	Email	Phil_Fessler@nps.gov
Project	AMK Ranch Seawall	Project	Grant Teton Septic Replacements
Candidate's role on project	Quality Control Manager	Candidate's role on project	Quality Control Manager

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

OSHA's Form 300A (Rev. 04/2004)

Summary of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it.
Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader.

Year 20 22

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of . . .	(M)		
(1) Injuries	0	(4) Poisonings	0
(2) Skin disorders	0	(5) Hearing loss	0
(3) Respiratory conditions	0	(6) All other illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name: West Fork Construction

Street: 3620 South Park Dr.

City: Jackson State: WY Zip: 83001

Industry description (*e.g., Manufacture of motor truck trailers*)

Construction

North American Industrial Classification (NAICS), if known (e.g., 336212)

2 3 6 2 2 0

Employment information *(If you don't have these figures, see the Worksheet on the next page to estimate.)*

Annual average number of employees: 4

Total hours worked by all employees last year: 8,000.00

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

John Kinnard — Company executive

Managing Partner — Title

Phone 317-833-3985 Date 9/11/25

Reset

OSHA's Form 300A (Rev. 04/2004)

Summary of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it.
Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader.

Year 20 23

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of . . . (M)			
(1) Injuries	0	(4) Poisonings	0
(2) Skin disorders	0	(5) Hearing loss	0
(3) Respiratory conditions	0	(6) All other illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name: West Fork Construction

Street: 3620 South Park Dr.

City: Jackson State: WY Zip: 83001

Industry description (*e.g., Manufacture of motor truck trailers*)

Construction

North American Industrial Classification (NAICS), if known (e.g., 336212)

2 3 6 2 2 0

Employment information *(If you don't have these figures, see the Worksheet on the next page to estimate.)*

Annual average number of employees: 4

Total hours worked by all employees last year: 8,000.00

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

John Kinnard — Company executive

Managing Partner — Title

Phone 317-833-3985 Date 9/11/25

Reset

OSHA's Form 300A (Rev. 04/2004)

Summary of Work-Related Injuries and Illnesses

Note: You can type input into this form and save it.
Because the forms in this recordkeeping package are "fillable/writable" PDF documents, you can type into the input form fields and then save your inputs using the free Adobe PDF Reader.

Year 20 24

U.S. Department of Labor
Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no work-related injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete and accurate before completing this summary.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the Log. If you had no cases, write "0."

Employees, former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR Part 1904.35, in OSHA's recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
0	0
(K)	(L)

Injury and Illness Types

Total number of . . . (M)			
(1) Injuries	0	(4) Poisonings	0
(2) Skin disorders	0	(5) Hearing loss	0
(3) Respiratory conditions	0	(6) All other illnesses	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form.

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instructions, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any other aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistical Analysis, Room N-3644, 200 Constitution Avenue, NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name: West Fork Construction

Street: 3620 South Park Dr.

City: Jackson State: WY Zip: 83001

Industry description (*e.g., Manufacture of motor truck trailers*)

Construction

North American Industrial Classification (NAICS), if known (e.g., 336212)

2 3 6 2 2 0

Employment information *(If you don't have these figures, see the Worksheet on the next page to estimate.)*

Annual average number of employees: 4

Total hours worked by all employees last year: 8,000.00

Sign here

Knowingly falsifying this document may result in a fine.

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

John Kinnard — Company executive

Managing Partner — Title

Phone 317-833-3985 Date 9/11/25

Reset

Balance Sheet for West Fork Construction REDACTED: 3 Pages

West Fork Construction, LLC
PO Box 10021
Jackson, WY 83001

September 25, 2025

Project – High School Road Pumphouse

Below is West Fork Construction LLC's proposed subcontractors,

- General Conditions & Supervision: West Fork Construction, LLC
- Trenching & Site Work: HV Excavation
- Well: Dover Drilling
- Concrete: JB Custom Construction
- Framing: JT Construction
- Roofing: Elite Roofing
- Insulation: Advanced Insulation
- Overhead Doors: Doorman of Idaho
- Process Piping: HV Excavation
- HVAC: Sprinter Heating & Hydronics
- Electrical Connections: Mountain Electric

Thank you for the opportunity to submit this subcontractor list.

Regards,

Paul L. Kinnard
Managing Partner
West Fork Construction, LLC
PO Box 10021
Jackson, WY 83002
(307) 413-1736

West Fork Construction, LLC
PO Box 10021
Jackson, WY 83001

September 25, 2025

Project – High School Road Pump House

Below is West Fork Construction LLC's proposed unit cost line items to be performed under bid line item 2 "Force Account"

- Project Manager: $105/HR
- Project Superintendent: $95/HR
- Laborer: $75/HR
- Electrician: $140/HR
- HVAC: $150/HR
- Skid Steer: $155/HR
- Mini Ex: $155/HR
- Excavator: $205/HR
- Trucking: $165/HR
- Semi Trucking: $210/HR

Thank you for the opportunity to submit this unit cost information.

Regards,

Paul L. Kinnard
Managing Partner
West Fork Construction, LLC
PO Box 10021
Jackson, WY 83002
(307) 413-1736

Town of Jackson

150 E Pearl Avenue
PO Box 1687
Jackson, WY 83001
Phone: 307-733-3932
https://www.jacksonwy.gov/

Building Contractor- Class B

License Number : CL-24-0079

West Fork Construction LLC

PO Box 10021

Jackson

Fees Paid: **$170.00**

Issued Date: **11/21/2024**

11/21/2024 - 12/31/2025

Valid Dates

STATE OF WYOMING

CERTIFICATE OF RESIDENCY

Contractor Number: 1634

WEST FORK CONSTRUCTION, LLC

HAS BEEN GRANTED RESIDENCY STATUS PURSUANT TO WYOMING STATUTE 16-6-101, AS AMENDED. FIVE PERCENT PREFERENCE SHALL BE ALLOWED WHEN BIDDING ON ANY PUBLIC WORKS CONTRACT FOR A PERIOD OF ONE (1) YEAR FROM THE DATE CERTIFICATION IS GRANTED.

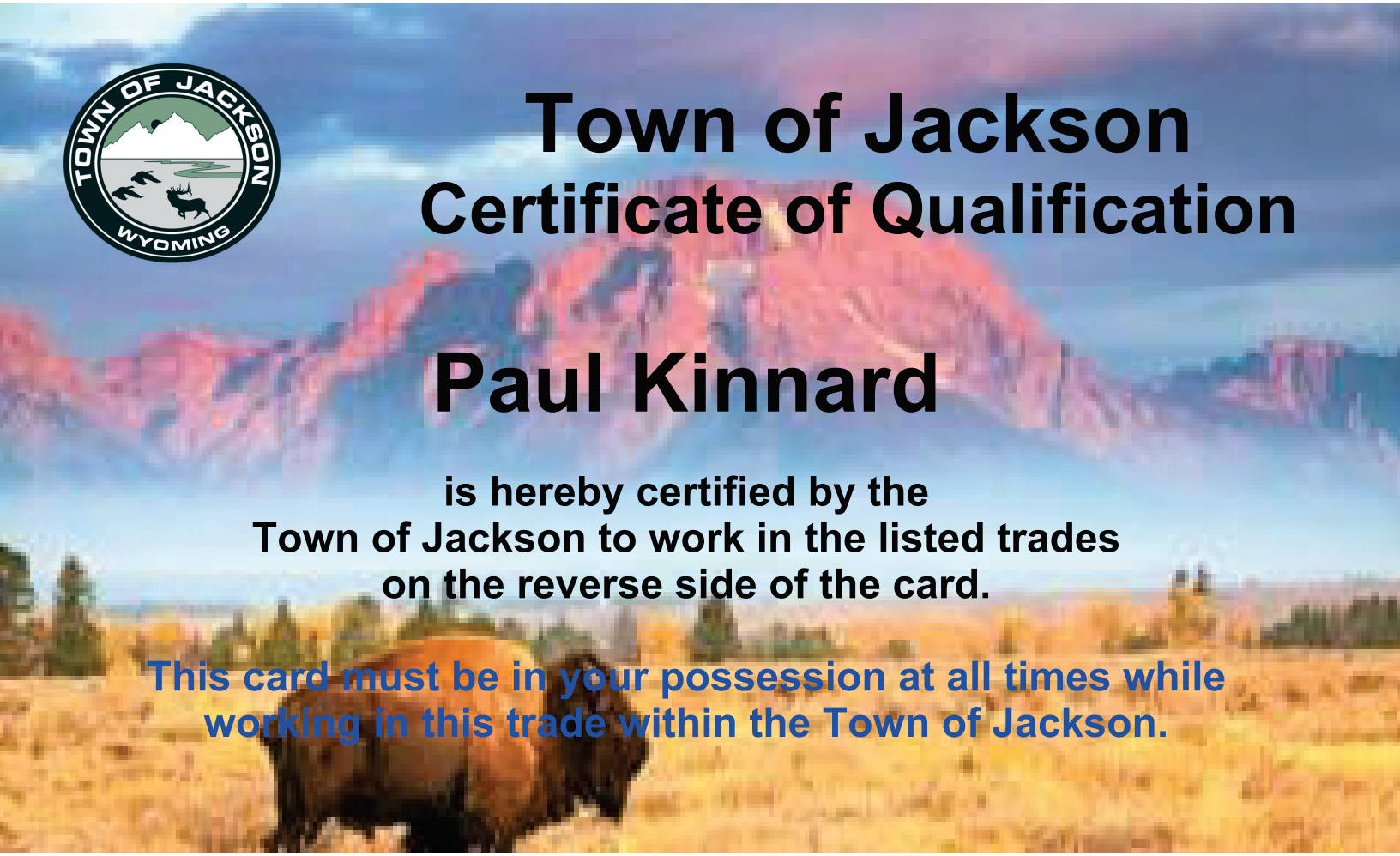
GRANTED THIS 2ND DAY of DECEMBER TWO THOUSAND AND 24

Michele Johnson, Program Manager

EXPIRATION DATE: 12/1/2025

To verify the authenticity of the certificate, please contact our office at 307-777-7261 or visit wyomingworkforce.org/businesses/labor/info

CERTIFICATE SERIAL NUMBER: 0212202409



Town of Jackson
Certificate of Qualification

Paul Kinnard

is hereby certified by the
Town of Jackson to work in the listed trades
on the reverse side of the card.

This card must be in your possession at all times while working in this trade within the Town of Jackson.

COQ#	Level	Type of Certification	Expires
COQ-25-0200	Master	Building Contractor Class B	12/31/2028

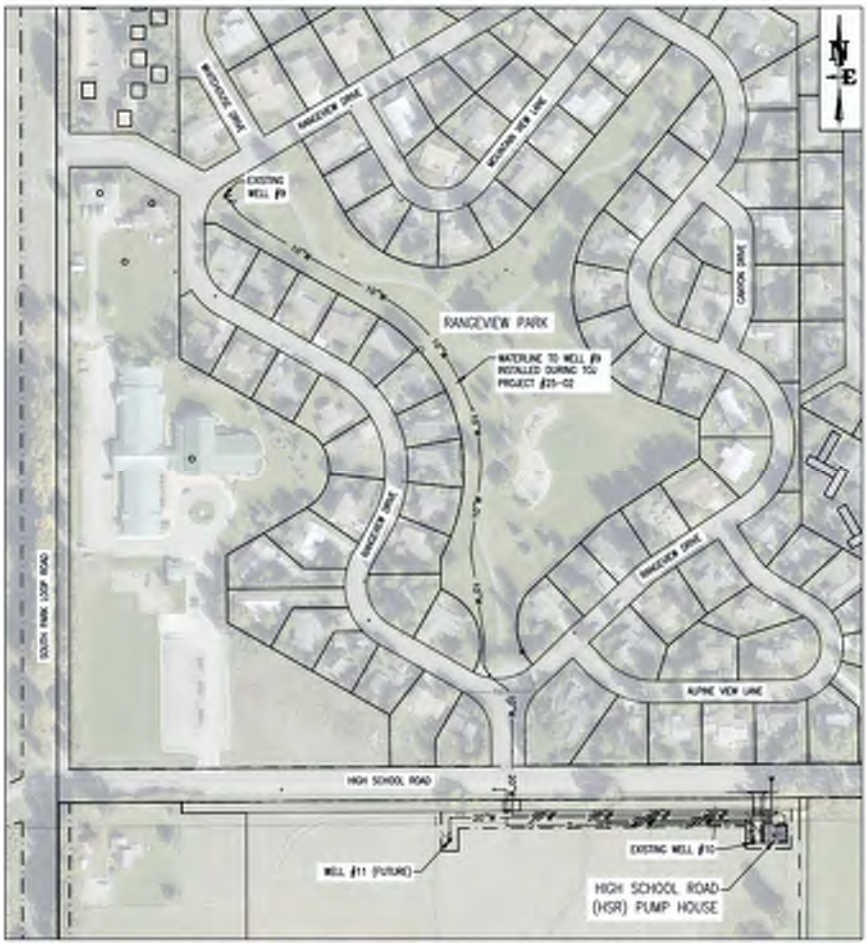
Town Of Jackson
PO Box 1687
150 East Pearl
Jackson, WY 83001

(307) 733-3932
www.TownOfJackson.com

PROJECT MANUAL

2025 HIGH SCHOOL ROAD PUMP HOUSE

TOJ PROJECT # 26-06



Owner:
Town of Jackson
P.O. Box 1687
150 East Pearl Street
Jackson, Wyoming 83001
(307) 733-3932
townengineering@jacksonwy.gov

Engineer:
Nelson Engineering
P.O. Box 1599
430 South Cache Street
Jackson, Wyoming 83001
(307) 733-2087
jkilpatrick@nelsonengineering.net

AUGUST 2025

TABLE OF CONTENTS

JACKSON, WYOMING

ADVERTISEMENT FOR BIDS 1

INSTRUCTIONS TO BIDDERS ..... .1 TO 12

WYOMING PREFERENCE ACT ..... 1 TO 1

BID FORM AND DOCUMENTS ....1 TO 10

CONTRACT AGREEMENT & BONDS ..... 1 TO 17

GENERAL CONDITIONS ....1 TO 70

SUPPLEMENTARY CONDITIONS ..... 1 TO 17

SUPPLEMENTAL CONTRACT FORMS ....1 TO 14

SPECIFICATIONS ..... 1013 PAGES

DRAWINGS ..... 52 PAGES

SECTION I

BIDDING & CONTRACT DOCUMENTS

ADVERTISEMENT FOR BIDS
Town of Jackson, Wyoming
2025 High School Road Pump House - TOJ Bid No. 26-06

Notice is hereby given that the **Town of Jackson, Wyoming** is requesting Bids for the construction of the **2025 High School Road Pump House.** Bids will be received at the Office of the Town Clerk**, Town of Jackson, PO Box 1687,** located at **150 East Pearl Avenue, Jackson, WY 83001 (Town Hall)**, emailed bids will be received at TownClerk@jacksonwy.gov until **Thursday, September 25th, 2025 at 1:00pm** local time. At that time the Bids received will be publicly opened and read. Bids shall be delivered according to the instructions to bidders. A mandatory **pre-bid conference** will be held at the Nelson Engineering Office at 430 South Cache on **Tuesday September 9th, 2025 at 2:00 PM MST**. A link for a remote meeting will be provided.

The Project includes the construction of a 1300 s.f. pump house, complete with electrical, HVAC, standby power and treatment works for two public water supply wells with provisions to accommodate a future third well; installation of conductors and data cables to two well sites; and associated sitework. The facility shall be substantially complete and ready for operation by May 1st, 2026, with a final completion of July 1st, 2026. Bidding documents will be posted electronically on Wednesday, August 27th, 2025 by the Issuing Office, Town of Jackson Engineering Division.

Complete digital bidding documents will be available at www.questcdn.com. You may download the digital documents by inputting QuestCDN project No. **9309581** or Owner Project No. **26-06** on the website's projects tab search page. Paper or Partial sets of Bidding Documents will not be available from the Issuing Office. Neither Owner nor Engineer will be responsible for full or partial sets of Bidding Documents, including Addenda if any, obtained from sources other than the Issuing Office. Questions regarding the Bidding Documents: jkilpatrick@nelsonengineering.net (307-690-2086).

For all further requirements regarding bid submittal, qualifications, procedures, and contract award, refer to the Instructions to Bidders that are included in the Bidding Documents. A bid security in the amount of 5% of the bid shall accompany each bid. All bids are to be prepared in accordance with the Bidding Documents. Responsible Wyoming bidders will be given a 5% preference. The Town of Jackson reserves the right to reject any and all bids, and to waive all informalities.

****

Advertisement: **September 20 and 27, 2025**

.

INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

TABLE OF CONTENTS

Page

Article 1— Defined Terms 1

Article 2— Bidding Documents 1

Article 3— Qualifications of Bidders 2

Article 4— Pre-Bid Conference 2

Article 5— Site and Other Areas; Existing Site Conditions; Examination of Site; Owner's Safety Program; Other Work at the Site 3

Article 6— Bidder's Representations and Certifications 4

Article 7— Interpretations and Addenda 5

Article 8— Bid Security 5

Article 9— Contract Times 6

Article 10— Liquidated Damages 6

Article 11— Substitute and "Or Equal" Items 6

Article 12— Subcontractors, Suppliers, and Others 6

Article 13— Preparation of Bid 7

Article 14— Basis of Bid 8

Article 15— Submittal of Bid 8

Article 16— Modification and Withdrawal of Bid 9

Article 17— Opening of Bids 9

Article 18— Bids to Remain Subject to Acceptance 9

Article 19— Evaluation of Bids and Award of Contract 9

Article 20— Bonds and Insurance 10

Article 21— Signing of Agreement 11

Article 22— Sales and Use Taxes 11

Article 23— Retainage 11

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 1—DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

Issuing Office—The office from which the Bidding Documents are to be issued, and which registers plan holders.

Town of Jackson
www.questcdn.com
Town Engineering Department
townengineering@jacksonwy.gov
307-733-3079

ARTICLE 2—BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement. Owner requires that Bidder register as a plan holder with the Issuing Office and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive notice of Addenda issued by Owner.

2.04 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are required to register as plan holders from the Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.

2.05 Electronic Documents

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1. Bidding Documents will be provided in PDF (Portable Document Format; .pdf) that is readable by Adobe Acrobat Reader Version **Standard 2017** or later, Revu BlueBeam 20 or later version. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3—QUALIFICATIONS OF BIDDERS

3.01 Bidder is to submit the following information with its Bid to demonstrate Bidder's qualifications to perform the Work:

A. Written evidence establishing its qualifications such as financial data, previous experience, and present commitments.

B. A written statement that Bidder is authorized to do business in the state where the Project is located, or a written certification that Bidder will obtain such authority prior to the Effective Date of the Contract. [Acceptable documentation is a statement of good standing from the Wyoming Secretary of State's office. For residency, include your Wyoming Resident Contractor Certificate of Residency from the Wyoming Department of Workforce Services.]

C. Bidder's state or other contractor license number, if applicable. [Not applicable for this project.]

D. Subcontractor and Supplier qualification information.

E. Other required information regarding qualifications.

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4—PRE-BID CONFERENCE

4.01 A **MANDATORY Pre-Bid Conference** will be held at the time and location indicated in the Advertisement to bid. Representatives of Owner and Engineer will be present to discuss the Project.

4.02 Information presented at the Pre-Bid Conference does not alter the Contract Documents. Owner may issue Addenda to make any changes to the Contract Documents that result from discussions

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

at the Pre-Bid Conference. Information presented, and statements made at the Pre-Bid Conference will not be binding or legally effective unless incorporated in an Addendum.

ARTICLE 5—SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 Site and Other Areas

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:

    a. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.

    b. Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.

    c. Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

    d. Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

B. *Underground Facilities:* Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

5.03 Site Visit and Testing by Bidders

A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.

B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.

D. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

5.04 Owner's Safety Program

A. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.05 Other Work at the Site

A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 Express Representations and Certifications in Bid Form, Agreement

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 7—INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing.

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.

7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8—BID SECURITY

8.01 A Bid must be accompanied by Bid Security made payable to Owner in an amount of **five percent (5%)** of Bidder's maximum Bid price (determined by adding the base bid and all alternates, if any). Bid Security shall be a Cashier's Check, Irrevocable Letter of Credit or a Bid Bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions. Such Bid Bond will be issued in the form included in the Bidding Documents.

8.02 The Bid Security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract, furnished the required Contract Security, and met the other conditions of the Notice of Award, whereupon the Bid Security will be released. If the Successful Bidder fails to execute and deliver the Contract and furnish the required Contract Security within 10 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid Security of that Bidder will be forfeited, in whole in the case of a penal sum Bid Bond, and to the extent of Owner's damages in the case of a damages-form bond. Such forfeiture will be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid Security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid Security furnished by such Bidders will be released.

8.04 Bid Security of other Bidders that Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 9—CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

ARTICLE 10—LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 11—SUBSTITUTE AND "OR EQUAL" ITEMS

11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

11.02 All prices that Bidder sets forth in its Bid will be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 12—SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

12.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work with the bid:

A. Pipe supplier(s).

B. Geotextile supplier.

C. Pre-Cast Concrete supplier.

D. Aggregate materials supplier.

E. Cast In Place Concrete Subcontractor and supplier.

F. Paving Subcontractor and supplier.

12.03 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given,

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

12.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid Security of any Bidder. Any Subcontractor or Supplier, so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.07 of the General Conditions.

ARTICLE 13—PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

13.02 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

13.03 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation must be shown.

13.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

13.05 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown.

13.06 A Bid by an individual must show the Bidder's name and official address.

13.07 A Bid by a joint venture must be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture must be shown.

13.08 All names must be printed in ink below the signatures.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

13.09 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.

13.10 Postal and e-mail addresses and telephone number for communications regarding the Bid must be shown.

13.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

13.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 14—BASIS OF BID

14.01 Lump Sum

A. Bidders must submit a Bid on a lump sum basis as set forth in the Bid Form.

14.02 Unit Price

A. Bidders must submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity", which Owner or its representative has set forth in the Bid Form, for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

ARTICLE 15—SUBMITTAL OF BID

15.01 The Bid Form is to be completed and submitted with the Bid Security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

15.02 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid Security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

ARTICLE 16—MODIFICATION AND WITHDRAWAL OF BID

16.01 An unopened Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.

16.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid Security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

ARTICLE 17—OPENING OF BIDS

17.01 Bids will be opened at the time and place indicated in the advertisement or invitation to bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 18—BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid Security prior to the end of this period.

A. Within 10 days of the bid opening the Owner may require from any bidder a project schedule detailing work items and milestone dates.

ARTICLE 19—EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

19.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

19.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

the Bid, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner will reject the Bid as nonresponsive.

19.04 If Owner awards the contract for the Work, such award shall be to the responsible and certified resident making the lowest responsive bid, if the certified resident's bid is not more than five percent (5%) higher than that of the lowest responsible nonresident bidder and the resident bidder does not propose to subcontract more than thirty percent (30%) of the work to nonresident contractors. A resident for this purpose must be certified as a resident by the Wyoming Department of Workforce Services prior to bidding upon the Contract. See W.S. 16-6-101, et seq. A resident bidder shall submit a copy of its certificate of residency with its bid.

19.05 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. In the comparison of Bids, alternates will be applied in the same order of priority as listed in the Bid Form. To determine the Bid prices for purposes of comparison, Owner will announce to all bidders a "Base Bid plus alternates" budget after receiving all Bids, but prior to opening them. For comparison purposes alternates will be accepted, following the order of priority established in the Bid Form, until doing so would cause the budget to be exceeded. After determination of the Successful Bidder based on this comparative process and on the responsiveness, responsibility, and other factors set forth in these Instructions, the award may be made to said Successful Bidder on its base Bid and any combination of its additive alternate Bids for which Owner determines funds will be available at the time of award.

C. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

19.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

19.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 20—BONDS AND INSURANCE

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

20.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 21—SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 10 days thereafter, Successful Bidder must execute and deliver the required number of counterparts of the Agreement and any bonds and insurance documentation required to be delivered by the Contract Documents to Owner. Within 10 days thereafter, Owner will deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 22—SALES AND USE TAXES

22.01 *Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work. Said taxes must be included in the Bid.*

ARTICLE 23—RETAINAGE

23.01 *Provisions concerning Contractor's retainage are set forth in the Agreement.*

ARTICLE 24—WYOMING PREFERENCE

24.01 Responsible resident bidders will receive a five percent (5%) preference in accordance with Wyoming State Statute 16-6-102.

"… the contract shall be let to the responsible resident making the lowest bid if the resident's bid is not more than five percent (5%) higher than that of the lowest responsible non-resident bidder…"

24.02 Certification of resident status shall be submitted with the Bid. Bidders seeking residency status must apply for such status pursuant to Wyoming State Statute 16-6-101, as amended, and rules and regulations promulgated by the Wyoming Department of Labor and Statistics. Bidders are solely responsible for contacting the Wyoming Department of Labor and Statistics to determine any revisions and current policies regarding residency status. Bidders who qualify for resident status shall be required to comply with Wyoming State Statute 16-6-103:

"… Resident bidder shall not subcontract more than thirty percent (30%) of the work… to non-resident contractors."

24.02 Preference for State Labor and Materials: Pursuant to Wyoming State Statute 16-6-201 et seq. (1977), resident Wyoming laborers, workmen and mechanics shall be used in the performance of the Contract and any contract awarded as a result of the Contract; except that other laborers may be used when Wyoming laborers are not available for employment from within the State or are not qualified to perform the work involved. Pursuant to Wyoming State Statute 16-6-104 (1977), resident Wyoming laborers, workmen and mechanics shall be used upon all work enumerated in Wyoming State Statute 16-6-102 (1977) whenever possible and Wyoming materials and products

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

of equal quality and desirability shall have preference over materials or products produced outside the state. Pursuant to Wyoming State Statute 16-6-106 (1977), preference is hereby given to materials supplied or grown in Wyoming, quality being equal to articles offered by the competitors outside of the state. Pursuant to Wyoming State Statute 16-6-107 (1977), all public structures constructed in the State of Wyoming shall be constructed and maintained by materials produced or manufactured in Wyoming if Wyoming materials are suitable and can be furnished in marketable quantities. Preference shall not be granted for materials of an inferior quality to those offered by competitors outside of the state, but a differential of not to exceed five percent (5%) may be allowed in cost of Wyoming materials of equal quality as against materials from states having or enforcing a preference rule against "out-of-state" products.

REMAINDER OF PAGE LEFT BLANK INTENTIONALLY

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

WYOMING PREFERENCE ACT OF 1971
WYOMING PREVAILING WAGE
FEDERAL FUNDS

1. Every person who is charged with the duty of construction, reconstructing, improving, enlarging, altering or repairing any public works project or improvement for the state or any political subdivision, municipal corporation, or other governmental unit, shall employ only Wyoming laborers on the project or improvement. Every contract let by any person shall contain a provision requiring that Wyoming labor be used except other laborers may be used when Wyoming laborers are not available for the employment from within the state or are not qualified to perform the work involved. The contract shall contain a provision requiring specific acknowledgement of the requirements of this section.
2. A person required to employ Wyoming laborers may employ other than Wyoming laborers if:
   A. That person informs the nearest state workforce center of his employment needs at least eleven (11) days before work is commenced; and
   B. The state workforce center certifies that the person's need for laborers cannot be filled from those Wyoming laborers listed with the Wyoming Department of Workforce Services. The Department shall respond to a person's request for certification within ten (10) days of the date the information is filled.
3. Upon request by the workforce center, the general contractor shall provide the most recent construction schedule for the project.
4. Certified payroll reporting is required by Wyoming Statute §16-6-205(b).
5. These provisions shall be referenced in all contracts, sub-contracts and subsequent lower tier subcontracts.
6. Bidders / Contractors / Subcontractors acknowledgment of this provision.

Name:_____ Date: _____

BID FORM FOR CONSTRUCTION CONTRACT

The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 1—OWNER AND BIDDER

1.01 This Bid is submitted to:

Town of Jackson
P.O. Box 1687
150 East Pearl Avenue
Jackson, Wyoming 83001
TownClerk@jacksonwy.gov

Town of Jackson Project Number 26-06

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2—ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid Security;

B. Bidder's Qualifications

C. List of Proposed Subcontractors;

D. List of Proposed Suppliers;

E. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids; Acceptable documentation is a statement of good standing from the Wyoming Secretary of State's office. For residency, include your Wyoming Resident Contractor Certificate of Residency from the Wyoming Department of Workforce Services.; and

F. Contractor's license number as evidence of Bidder's State Contractor's License, Class B in accordance with Teton County, WY. or a covenant by Bidder to obtain said license within the time for acceptance of Bids

ARTICLE 3—BASIS OF BID—LUMP SUM BID AND UNIT PRICES

3.01 Unit Price Bids

A. Bidder will complete the Work in accordance with the Contract Documents for the following lump sum (stipulated) price(s) and indicated unit prices. The following bid schedule is the total of respective schedules.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

BID SCHEDULE

2025 HIGH SCHOOL ROAD PUMP HOUSE

BASE BID

ITEM	* Construction Item		Quantity	Unit	Unit Price	Total
1	Mobilization (10% of Bid Price Maximum)		1	LS		
2	Force Account (Owner's Contingency)		T&M	-	$155,000.00	$155,000
3	Well 9 Completion					
	3.01	Pump, Motor & Elec. Cable to Disconnect	LS	1		
	3.02	Column Pipe & Check Valve	LS	1		
	3.03	** Install Pressure Transducer	LS	1		
	3.04	Electrical Pedestal and Well Disconnect	LS	1		
4	Well 10 Completion					
	4.01	Pump, Motor & Elec. Cable to Disconnect	LS	1		
	4.02	Column Pipe & Check Valve	LS	1		
	4.03	** Install Pressure Transducer	LS	1		
	4.04	Chemical (Chlor. & Phos.) Drop Pipes	LS	1		
	4.05	Electrical Pedestal and Well Disconnect	LS	1		
5	Pump House Building					
	5.01	Excavation & Backfill	LS	1		
	5.02	Concrete Foundation	LS	1		
	5.03	Sanitary Waste/Floor Drain System, Manhole & Pump	LS	1		
	5.04	Concrete Slab	LS	1		
	5.05	Wall & Roof Framing	LS	1		
	5.06	Roof, Facia and Soffit	LS	1		
	5.07	Man Doors & Windows	LS	1		
	5.08	Roll Up Doors	EA	3		
	5.09	Siding & Trim	LS	1		
	5.10	Building Paint & Finishes	LS	1		
6	Building Process Piping					
	6.01	10" Gate Valves	EA	3		
	6.02	20" Gate Valves	EA	1		
	6.03	10" Check Valves	EA	3		
	6.04	20" Gate Valves	EA	1		
	6.05	** Install 10" Meters	EA	2		
	6.06	Fire Suppression System	LS	1		
	6.07	Mics. Pipe, Valves & Fittings	LS	1		
7	Building HVAC					
	7.01	Unit Heaters	EA	4		
	7.02	Exhaust Fans	EA	2		
	7.03	Control & Disinfection Room Louvers	EA	2		
	7.04	Generator Intake Louvers & Dampers	EA	4		
	7.05	Generator Exhaust Louver	EA	1		
	7.06	AC and Fan Coil Units	EA	3		

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ITEM	* Construction Item		Quantity	Unit	Unit Price	Total
8	Building & Site Electrical					
	8.01	Building Electrical Service (Transformer & Pad, CT, Meter, etc.)	LS	1		
	8.02	Building Electrical Panels & Transformers	LS	1		
	8.03	** Installation of Well Filters & VFDs	EA	2		
	8.04	** Installation of Well 9 Sinewave Filter	EA	1		
	8.05	In-Ground Pull Boxes (Well 9 & 11)	EA	2		
	8.06	Well Power Conduit Extension to Building	LF	150		
	8.07	Well 9 Disconnect & 1850-LF of Conductors	LS	1		
	8.08	Well 10 Disconnect & 45-LF of Conductors	LS	1		
	8.09	Electrical & Controls for HVAC Systems	LS	1		
	8.10	Building Electrical (RCPs) and Lighting	LS	1		
	8.11	Generator Electrical Complete	LS	1		
9	Standby Generator					
	9.01	Diesel Generator	LS	1		
	9.02	Automatic Transfer Switch	LS	1		
	9.03	Air Cooling System	LS	1		
	9.04	Day Tank and Fill Station	LS	1		
	9.05	Muffler	LS	1		
10	Chlorine Disinfection System					
	10.01	System Water Supply Plumbing	LS	1		
	10.02	Well 9 Chemical Booster Pump	LS	1		
	10.03	** Install Solenoid Valves and Injectors	EA	2		
	10.04	System Chemical Discharge Plumbing	LS	1		
11	Orthophosphate System					
	11.01	System Water Supply Plumbing	LS	1		
	11.02	** Install Chemical Metering Pumps	EA	2		
	11.03	Metering Pump Stand	LS	1		
	11.04	Chemical Storage Tank & Feed Plumbing	LS	1		
	11.05	Well 9 Chemical Booster Pump	LS	1		
	11.06	System Chemical Discharge Plumbing	LS	1		
12	Site Improvements					
	12.01	Concrete Aprons	SF	130		
	12.02	Adjust MH Lids & Valve Collars	EA	8		
	12.03	Paved Driveway & Parking	SF	2320		
	12.04	Post, Rail & Wire Fence	LF	250		
	12.05	Access Gate	LS	1		

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ITEM	* Construction Item		Quantity	Unit	Unit Price	Total
13	Irrigation & Landscaping					
	13.01	Topsoil & Meadow Sod	SF	2420		
	13.02	Topsoil & Hydroseed	SF	8900		
	13.03	Colorado Spruce (14')	EA	1		
	13.04	Colorado Spruce (16')	EA	1		
	13.05	Aspen	EA	3		
	13.06	Dogwood	EA	5		
	13.07	Willow	EA	20		
	13.08	Irrigation System	LS	1		
BID TOTAL (use numbers)						

*See Section 01 27 00 - "Measurement & Payment Procedures" for method of measurement and payment for each bid item. The Bid Schedule listed above shall not be considered comprehensive in nature, where items identified in the drawings and specifications that are required for completion of the work may not be completely identified. Items not completely identified shall be included in the prices bid for various contract/bid items and no additional compensation will be allowed.
** "Install", or "installation", described in this Bid Schedule, shall imply that equipment is furnished by Owner and installed by Contractor.

B. Bidder acknowledges that:

1. Each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and

2. Estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3. The Bid Schedule is provided for convenience and shall not be construed as exhaustive or all-inclusive. The Contractor is responsible for reviewing all drawings, specifications, and contract documents in their entirety. Any materials, equipment, labor, or services required to complete the Work in accordance with the Contract Documents, whether or not specifically itemized in the Bid Schedule, shall be deemed included in the Contractor's bid prices for the applicable line items. No additional compensation shall be due for any such items, and the Contractor shall not be entitled to a change order or claim for compensation based on the omission of any required item from the Bid Schedule.

ARTICLE 4—TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5—BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 Bid Acceptance Period

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

period of time that Bidder may agree to in writing upon request of Owner.

5.02 Instructions to Bidders

A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 Receipt of Addenda

A. Bidder acknowledges receipt of the Addenda following the Bid Schedule.

ARTICLE 6—BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 Bidder's Representations

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.
2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.
4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.
5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.
6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.
7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.
8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 Bidder's Certifications

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.
2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
3. Bidder has not solicited or induced any individual or entity to refrain from bidding.
4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:

a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

REMAINDER OF PAGE LEFT BLANK INTENTIONALLY

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Bidder hereby acknowledges receipt of the following Addenda

Addendum Number	Addendum Date

BID BOND (PENAL SUM FORM)

Bidder	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Bid**
Name: **Town of Jackson, Wyoming**	Project *(name and location)*:
Address *(principal place of business)*: **P.O. Box 1687 150 East Pearl Avenue Jackson, Wyoming 83001**	**Town of Jackson 2025 High School Road Pump House**
	Bid Due Date: **1:00 PM, 25 September 2025**
Bond	
Penal Sum:	
Date of Bond:	

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

Bidder	Surety
_____ *(Full formal name of Bidder)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature) (Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title:	Title:

Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
    3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
    3.2. All Bids are rejected by Owner, or
    3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

QUALIFICATION STATEMENT

ARTICLE 1—GENERAL INFORMATION

1.01 Provide contact information for the Business:

Legal Name of Business:			
Corporate Office			
Name:		Phone number:	
Title:		Email address:	
Business address of corporate office:			
Local Office			
Name:		Phone number:	
Title:		Email address:	
Business address of local office:			

1.02 Provide information on the Business's organizational structure:

Form of Business:	☐ Sole Proprietorship ☐ Partnership ☐ Corporation		
☐ Limited Liability Company ☐ Joint Venture comprised of the following companies:			
	1.		
	2.		
	3.		
Provide a separate Qualification Statement for each Joint Venturer.			
Date Business was formed:		State in which Business was formed:	
Is this Business authorized to operate in the Project location?	☐ Yes ☐ No ☐ Pending		

1.03 Identify all businesses that own Business in whole or in part (25% or greater), or that are wholly or partly (25% or greater) owned by Business:

Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			
Name of business:		Affiliation:	
Address:			

1.04 Provide information regarding the Business's officers, partners, and limits of authority.

Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	
Authorized to sign contracts: ☐ Yes ☐ No		Limit of Authority:	$
Name:		Title:	

ARTICLE 2—LICENSING

2.01 Provide information regarding licensure for Business:

Name of License:			
Licensing Agency:			
License No:		Expiration Date:	
Name of License:			
Licensing Agency:			
License No:		Expiration Date:	

ARTICLE 3—DIVERSE BUSINESS CERTIFICATIONS

3.01 Provide information regarding Business's Diverse Business Certification, if any. Provide evidence of current certification.

Certification	Certifying Agency	Certification Date
☐ Disadvantaged Business Enterprise		
☐ Minority Business Enterprise		
☐ Woman-Owned Business Enterprise		
☐ Small Business Enterprise		
☐ Disabled Business Enterprise		
☐ Veteran-Owned Business Enterprise		
☐ Service-Disabled Veteran-Owned Business		
☐ HUBZone Business (Historically Underutilized) Business		
☐ Other		
☐ None		

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 4—SAFETY

4.01 Provide information regarding Business's safety organization and safety performance.

Name of Business's Safety Officer:		
Safety Certifications		
Certification Name	Issuing Agency	Expiration

4.02 Provide Worker's Compensation Insurance Experience Modification Rate (EMR), Total Recordable Frequency Rate (TRFR) for incidents, and Total Number of Recorded Manhours (MH) for the last 3 years and the EMR, TRFR, and MH history for the last 3 years of any proposed Subcontractor(s) that will provide Work valued at 10% or more of the Contract Price. Provide documentation of the EMR history for Business and Subcontractor(s).

Year									
Company	EMR	TRFR	MH	EMR	TRFR	MH	EMR	TRFR	MH

ARTICLE 5—FINANCIAL

5.01 Provide information regarding the Business's financial stability. Provide the most recent audited financial statement, and if such audited financial statement is not current, also provide the most current financial statement.

Financial Institution:		
Business address:		
Date of Business's most recent financial statement:		☐ Attached
Date of Business's most recent audited financial statement:		☐ Attached
Financial indicators from the most recent financial statement		
Contractor's Current Ratio (Current Assets ÷ Current Liabilities)		
Contractor's Quick Ratio ((Cash and Cash Equivalents + Accounts Receivable + Short Term Investments) ÷ Current Liabilities)		

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 6—SURETY INFORMATION

6.01 Provide information regarding the surety company that will issue required bonds on behalf of the Business, including but not limited to performance and payment bonds.

Surety Name:			
Surety is a corporation organized and existing under the laws of the state of:			
Is surety authorized to provide surety bonds in the Project location?	☐ Yes ☐ No		
Is surety listed in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" published in Department Circular 570 (as amended) by the Bureau of the Fiscal Service, U.S. Department of the Treasury? ☐ Yes ☐ No			
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

ARTICLE 7—INSURANCE

7.01 Provide information regarding Business's insurance company(s), including but not limited to its Commercial General Liability carrier. Provide information for each provider.

Name of insurance provider, and type of policy (CLE, auto, etc.):			
Insurance Provider		Type of Policy (Coverage Provided)	
Are providers licensed or authorized to issue policies in the Project location?		☐ Yes ☐ No	
Does provider have an A.M. Best Rating of A-VII or better?		☐ Yes ☐ No	
Mailing Address (principal place of business):			
Physical Address (principal place of business):			
Phone (main):		Phone (claims):	

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 8—CONSTRUCTION EXPERIENCE

8.01 Provide information that will identify the overall size and capacity of the Business.

Average number of current full-time employees:	
Estimate of revenue for the current year:	
Estimate of revenue for the previous year:	

8.02 Provide information regarding the Business's previous contracting experience.

Years of experience with projects like the proposed project:				
As a general contractor:		As a joint venturer:		
Has Business, or a predecessor in interest, or an affiliate identified in Paragraph 1.03:				
Been disqualified as a bidder by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been barred from contracting by any local, state, or federal agency within the last 5 years? ☐ Yes ☐ No				
Been released from a bid in the past 5 years? ☐ Yes ☐ No				
Defaulted on a project or failed to complete any contract awarded to it? ☐ Yes ☐ No				
Refused to construct or refused to provide materials defined in the contract documents or in a change order? ☐ Yes ☐ No				
Been a party to any currently pending litigation or arbitration? ☐ Yes ☐ No				
Provide full details in a separate attachment if the response to any of these questions is Yes.				

8.03 List all projects currently under contract in Schedule A and provide indicated information.

8.04 List a minimum of three and a maximum of six projects completed in the last 5 years in Schedule B and provide indicated information to demonstrate the Business's experience with projects similar in type and cost of construction.

8.05 In Schedule C, provide information on key individuals whom Business intends to assign to the Project. Provide resumes for those individuals included in Schedule C. Key individuals include the Project Manager, Project Superintendent, Quality Manager, and Safety Manager. Resumes may be provided for Business's key leaders as well.

ARTICLE 9—REQUIRED ATTACHMENTS

9.01 Provide the following information with the Statement of Qualifications:

A. If Business is a Joint Venture, separate Qualifications Statements for each Joint Venturer, as required in Paragraph 1.02.

B. Diverse Business Certifications if required by Paragraph 3.01.

C. Certification of Business's safety performance if required by Paragraph 4.02.

D. Financial statements as required by Paragraph 5.01.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

E. Attachments providing additional information as required by Paragraph 8.02.

F. Schedule A (Current Projects) as required by Paragraph 8.03.

G. Schedule B (Previous Experience with Similar Projects) as required by Paragraph 8.04.

H. Schedule C (Key Individuals) and resumes for the key individuals listed, as required by Paragraph 8.05.

I. Additional items as pertinent.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

This Statement of Qualifications is offered by:

Business: _____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(date signed)

(If Business is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Address for giving notices:

_____

_____

_____

Designated Representative:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Schedule A—Current Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Schedule B—Previous Experience with Similar Projects

Name of Organization					
Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Project Owner			Project Name		
General Description of Project					
Project Cost			Date Project		
Key Project Personnel	Project Manager	Project Superintendent	Safety Manager	Quality Control Manager	
Name					
Reference Contact Information (listing names indicates approval to contacting the names individuals as a reference)					
	Name	Title/Position	Organization	Telephone	Email
Owner					
Designer					
Construction Manager					

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Schedule C—Key Individuals

Project Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	
Project Superintendent			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

EJCDC® C-451, Qualifications Statement—Schedule C—Key Individuals.
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Safety Manager			
Name of individual			
Years of experience as project manager			
Years of experience with this organization			
Number of similar projects as project manager			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Quality Control Manager			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as project superintendent			
Number of similar projects in other positions			
Current Project Assignments			
Name of assignment		Percent of time used for this project	Estimated project completion date
Reference Contact Information (listing names indicates approval to contact named individuals as a reference)			
Name		Name	
Title/Position		Title/Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate's role on project		Candidate's role on project	

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

This Agreement is by and between **Town of Jackson, Wyoming** ("Owner") and _____ ("Contractor").

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

Owner and Contractor hereby agree as follows:

ARTICLE 1—WORK

1.01 The Project generally consists of construction of a 1300 s.f. pump house, complete with electrical, HVAC, standby power and treatment works for two public water supply wells with provisions to accommodate a future third well; installation of conductors and data cables to two well sites; completion of two public water supply wells; and associated sitework.

ARTICLE 2—THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **2025 High School Road Pump House**

ARTICLE 3—ENGINEER

3.01 The Owner has retained **Nelson Engineering** ("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by **Nelson Engineering (NE).**

ARTICLE 4—CONTRACT TIMES

4.01 *Time is of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for Final Payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Dates*

A. The Work will be substantially complete on or before **Friday, 1 May 2026**, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **Wednesday, 1 July 2026**. Substantial Completion shall include the installation of all underground work. Road restoration, paving, minor site work, revegetation, and clean up may be performed after the Substantial Completion date.

4.04 Milestones

A. Parts of the Work must be substantially completed on or before the following Milestone(s):

1. Milestone 1: As of **Friday, 1 May 2026**, the Well House shall be fully operational for public water supply and use by Owner.

EJCDC® C-520, Agreement between Owner and Contractor for Construction Contract (Stipulated Price).
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

4.05 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed within the Contract Times, as duly modified. The parties also recognize the delays, expense, and difficulties involved in proving, in a legal or arbitration proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. *Substantial Completion:* Contractor shall pay Owner **$1000** for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion, until the Work is substantially complete.

2. *Completion of Remaining Work:* After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner **$500** for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Substantial Completion, and final completion are not additive, and will not be imposed concurrently.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

ARTICLE 5—CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents, the amounts that follow, subject to adjustment under the Contract:

A. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

B. The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 6—PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 Progress Payments; Retainage

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment once each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. **95** percent of the value of the Work completed (with the balance being retainage).

b. **0** percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, and upon recommendation from the Engineer, Owner shall pay an amount sufficient to increase total payments to Contractor to **95** percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less **200 percent** of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 Final Payment

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions and as modified in the Supplementary Conditions, Section SC-15.06.

6.04 Consent of Surety

A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

6.05 Interest

A. All amounts not paid when due will bear interest at the rate of **5** percent per annum.

ARTICLE 7—CONTRACT DOCUMENTS

7.01 Contents

A. The Contract Documents consist of all of the following:

1. This Agreement.
2. Bonds:
    a. Performance bond (together with power of attorney).
    b. Payment bond (together with power of attorney).
    c. Warranty bond (together with power of attorney).
3. General Conditions.
4. Supplementary Conditions.
5. Specifications as listed in the table of contents of the project manual.
6. Drawings (not attached but incorporated by reference) consisting of **52** sheets with each sheet bearing the following general title: **Town of Jackson, 2025 High School Road Pump House**, and as listed on the attached sheet index.
7. Addenda (1, inclusive).
8. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid (pages **1** to **10**, inclusive)
    b. Documentation submitted by Contactor as Attachments to the Bid other than Bid Security. (See Bid Form)
9. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.
    e. Warranty Bond, if any.

B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7, except that state or federal law may instill rules by order.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 8—REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.

6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 Contractor's Certifications

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 Standard General Conditions

A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

Owner:	Contractor:
Town of Jackson, Wyoming	.
(typed or printed name of organization)	*(typed or printed name of organization)*
By: _	By: _____
(individual's signature)	*(individual's signature)*
Date: _	Date: _____
(date signed)	*(date signed)*
Name: Hailey Morton Levinson	Name: _____
(typed or printed)	*(typed or printed)*
Title: Town of Jackson Mayor	Title: _____
(typed or printed)	*(typed or printed)*
	*(If **[Type of Entity]** is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest: _	Attest: _____
(individual's signature)	*(individual's signature)*
Title: _	Title: _____
(typed or printed)	*(typed or printed)*
Address for giving notices:	Address for giving notices:
Town of Jackson	
P.O. Box 1687 / 150 East Pearl	
Jackson, WY 83001	
Designated Representative:	Designated Representative:
Name: Brian Lenz	Name: _____
(typed or printed)	*(typed or printed)*
Title: Town of Jackson Engineer	Title: _____
(typed or printed)	*(typed or printed)*
Address:	Address:
Town of Jackson	
P.O. Box 1687 / 450 West Snow King Drive	
Jackson, Wyoming 83001	
Phone: 307-733-4547	Phone: _____
Email: btlenz@jacksonwy.gov	Email: _____
	License No.: _____
	(where applicable)
	State: _____

EJCDC® C-520, Agreement between Owner and Contractor for Construction Contract (Stipulated Price).
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

PERFORMANCE BOND

Contractor	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*: **[Address of Surety's principal place of business]**
Owner	**Contract**
Name: **Town of Jackson**	Description *(name and location)*: **2025 High School Road Pump House**
Mailing address *(principal place of business)*: **150 E. Pearl St. P.O Box: 1687 Jackson, Wyoming 83001**	Contract Price:
	Effective Date of Contract: **[Date from Contract]**

Bond

Bond Amount: **[125% Original Contract Price]**

Date of Bond: **[Date]**

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Performance Bond, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

Contractor as Principal	Surety
_____	_____
(Full formal name of Contractor)	*(Full formal name of Surety) (corporate seal)*
By: _____	By: _____
(Signature)	*(Signature)(Attach Power of Attorney)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____
Attest: _____	Attest: _____
(Signature)	*(Signature)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

EJCDC® C-610, Performance Bond.
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:

    3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;

    3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

    3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

    5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

    5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

    5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

    5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

   7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

   7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

   7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

    14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

    14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

    14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

    14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

    14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

PAYMENT BOND

Contractor	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*: **[Address of Surety's principal place of business]**
Owner	**Contract**
Name: **Town of Jackson** Mailing address *(principal place of business)*: **150 E. Pearl St** **P.O Box: 1687** **Jackson, Wyoming 83001**	Description *(name and location)*: **2025 High School Road Pump House** Contract Price: **$** Effective Date of Contract:

Bond

Bond Amount: **[125% Original Contract]**

Date of Bond: **[Date]**

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Paragraph 18

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth in this Payment Bond, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

Contractor as Principal	Surety
_____ *(Full formal name of Contractor)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature)(Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

EJCDC® C-615, Payment Bond.
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond will arise after the following:

    5.1. Claimants who do not have a direct contract with the Contractor

        5.1.1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

        5.1.2. have sent a Claim to the Surety (at the address described in Paragraph 13).

    5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

    7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

    7.2. Pay or arrange for payment of any undisputed amounts.

    7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

    16.1. *Claim*—A written statement by the Claimant including at a minimum:

        16.1.1. The name of the Claimant;

        16.1.2. The name of the person for whom the labor was done, or materials or equipment furnished;

        16.1.3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;

        16.1.4. A brief description of the labor, materials, or equipment furnished;

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

16.1.5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

16.1.6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

16.1.7. The total amount of previous payments received by the Claimant; and

16.1.8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

18. Modifications to this Bond are as follows:

18.1. This bond guarantees the faithful performance of the prevailing hourly wage clause as provided by the contract.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

WARRANTY BOND

Contractor	**Surety**
Name: **[Full formal name of Contractor]** Address *(principal place of business)*: **[Address of Contractor's principal place of business]**	Name: **[Full formal name of Surety]** Address *(principal place of business)*: **[Insert address of Surety's principal place of business]**
Owner	**Construction Contract**
Name: **Town of Jackson** Address *(principal place of business)*: **150 E. Pearl St** **P.O Box: 1687** **Jackson, Wyoming 83001**	Description *(name and location)*: **2025 High School Road Pump House** Contract Price: **[Amount from Contract]** Effective Date of Contract: **[Date from Contract]** Contract's Date of Substantial Completion: **[Date from Contract]**

Bond

Bond Amount: **[Amount]**

Date of Bond: **[Date]**

Bond Period: Commencing 364 days after Substantial Completion of the Work under the Construction Contract, and continuing until **[insert number of years, typically either two or three]** years after such Substantial Completion.

Modifications to this Bond form:
☐ None ☐ See Paragraph 9

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth herein, do each cause this Warranty Bond to be duly executed by an authorized officer, agent, or representative.

Contractor as Principal	Surety
(Full formal name of Contractor)	*(Full formal name of Surety) (corporate seal)*
By: _____	By: _____
(Signature)	*(Signature) (Attach Power of Attorney)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title: _____	Title: _____
Attest: _____	Attest: _____
(Signature)	*(Signature)*
Name: _____	Name: _____
(Printed or typed)	*(Printed or typed)*
Title:	Title:

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party is considered plural where applicable.

EJCDC® C-620, Warranty Bond.
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract's Correction Period Obligations. The Construction Contract is incorporated herein by reference.
2. If the Contractor performs the Correction Period Obligations, the Surety and the Contractor shall have no obligation under this Warranty Bond.
3. If Owner gives written notice to Contractor and Surety during the Bond Period of Contractor's obligation under the Correction Period Obligations, and Contractor does not fulfill such obligation, then Surety shall be responsible for fulfillment of such Correction Period Obligations. Surety shall either fulfill the Correction Period Obligations itself, through its agents or contractors, or, in the alternative, Surety may waive the right to fulfill the Correction Period Obligations itself, and reimburse the Owner for all resulting costs incurred by Owner in performing Contractor's Correction Period Obligations, including but not limited to correction, removal, replacement, and repair costs.
4. The Surety's liability is limited to the amount of this Warranty Bond. Renewal or continuation of the Warranty Bond will not modify such amount, unless expressly agreed to by Surety in writing.
5. The Surety shall have no liability under this Warranty Bond for obligations of the Contractor that are unrelated to the Construction Contract. No right of action will accrue on this Warranty Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.
6. Any proceeding, legal or equitable, under this Warranty Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located and must be instituted within two years after the Surety refuses or fails to perform its obligations under this Warranty Bond.
7. Written notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown in this Warranty Bond.
8. Definitions

    8.1. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page of this Warranty Bond, including all Contract Documents and changes made to the agreement and the Contract Documents.

    8.2. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

    8.3. *Correction Period Obligations*—The duties, responsibilities, commitments, and obligations of the Contractor with respect to correction or replacement of defective Work, as set forth in the Construction Contract's Correction Period clause, EJCDC® C-700, Standard General Conditions of the Construction Contract (2018), Paragraph 15.08, as duly modified.

    8.4. *Substantial Completion*—As defined in the Construction Contract.

    8.5. *Work*—As defined in the Construction Contract.
9. Modifications to this Bond are as follows: [Describe modification or enter "None"]

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

Page

Article 1—Definitions and Terminology 1
1.01 Defined Terms 1
1.02 Terminology 6
Article 2—Preliminary Matters 7
2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance 7
2.02 Copies of Documents 7
2.03 Before Starting Construction 7
2.04 Preconstruction Conference; Designation of Authorized Representatives 8
2.05 Acceptance of Schedules 8
2.06 Electronic Transmittals 8
Article 3—Contract Documents: Intent, Requirements, Reuse 9
3.01 Intent 9
3.02 Reference Standards 9
3.03 Reporting and Resolving Discrepancies 10
3.04 Requirements of the Contract Documents 10
3.05 Reuse of Documents 11
Article 4—Commencement and Progress of the Work 11
4.01 Commencement of Contract Times; Notice to Proceed 11
4.02 Starting the Work 11
4.03 Reference Points 11
4.04 Progress Schedule 12
4.05 Delays in Contractor's Progress 12
Article 5—Site; Subsurface and Physical Conditions; Hazardous Environmental Conditions 13
5.01 Availability of Lands 13
5.02 Use of Site and Other Areas 14
5.03 Subsurface and Physical Conditions 15
5.04 Differing Subsurface or Physical Conditions 16

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

5.05 Underground Facilities 17
5.06 Hazardous Environmental Conditions at Site 19
Article 6—Bonds and Insurance 21
6.01 Performance, Payment, and Other Bonds 21
6.02 Insurance—General Provisions 22
6.03 Contractor's Insurance 24
6.04 Builder's Risk and Other Property Insurance 25
6.05 Property Losses; Subrogation 25
6.06 Receipt and Application of Property Insurance Proceeds 27
Article 7—Contractor's Responsibilities 27
7.01 Contractor's Means and Methods of Construction 27
7.02 Supervision and Superintendence 27
7.03 Labor; Working Hours 27
7.04 Services, Materials, and Equipment 28
7.05 "Or Equals" 28
7.06 Substitutes 29
7.07 Concerning Subcontractors and Suppliers 31
7.08 Patent Fees and Royalties 32
7.09 Permits 33
7.10 Taxes 33
7.11 Laws and Regulations 33
7.12 Record Documents 33
7.13 Safety and Protection 34
7.14 Hazard Communication Programs 35
7.15 Emergencies 35
7.16 Submittals 35
7.17 Contractor's General Warranty and Guarantee 38
7.18 Indemnification 39
7.19 Delegation of Professional Design Services 39
Article 8—Other Work at the Site 40
8.01 Other Work 40
8.02 Coordination 41
8.03 Legal Relationships 41

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Article 9—Owner's Responsibilities 42
9.01 Communications to Contractor 42
9.02 Replacement of Engineer 42
9.03 Furnish Data 42
9.04 Pay When Due 42
9.05 Lands and Easements; Reports, Tests, and Drawings 43
9.06 Insurance 43
9.07 Change Orders 43
9.08 Inspections, Tests, and Approvals 43
9.09 Limitations on Owner's Responsibilities 43
9.10 Undisclosed Hazardous Environmental Condition 43
9.11 Evidence of Financial Arrangements 43
9.12 Safety Programs 43
Article 10—Engineer's Status During Construction 44
10.01 Owner's Representative 44
10.02 Visits to Site 44
10.03 Resident Project Representative 44
10.04 Engineer's Authority 44
10.05 Determinations for Unit Price Work 45
10.06 Decisions on Requirements of Contract Documents and Acceptability of Work 45
10.07 Limitations on Engineer's Authority and Responsibilities 45
10.08 Compliance with Safety Program 45
Article 11—Changes to the Contract 46
11.01 Amending and Supplementing the Contract 46
11.02 Change Orders 46
11.03 Work Change Directives 46
11.04 Field Orders 47
11.05 Owner-Authorized Changes in the Work 47
11.06 Unauthorized Changes in the Work 47
11.07 Change of Contract Price 47
11.08 Change of Contract Times 49
11.09 Change Proposals 49
11.10 Notification to Surety 50

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Article 12—Claims 50
12.01 Claims 50
Article 13—Cost of the Work; Allowances; Unit Price Work 51
13.01 Cost of the Work 51
13.02 Allowances 55
13.03 Unit Price Work 55
Article 14—Tests and Inspections; Correction, Removal, or Acceptance of Defective Work 56
14.01 Access to Work 56
14.02 Tests, Inspections, and Approvals 56
14.03 Defective Work 57
14.04 Acceptance of Defective Work 58
14.05 Uncovering Work 58
14.06 Owner May Stop the Work 58
14.07 Owner May Correct Defective Work 59
Article 15—Payments to Contractor; Set-Offs; Completion; Correction Period 59
15.01 Progress Payments 59
15.02 Contractor's Warranty of Title 62
15.03 Substantial Completion 62
15.04 Partial Use or Occupancy 63
15.05 Final Inspection 64
15.06 Final Payment 64
15.07 Waiver of Claims 65
15.08 Correction Period 66
Article 16—Suspension of Work and Termination 67
16.01 Owner May Suspend Work 67
16.02 Owner May Terminate for Cause 67
16.03 Owner May Terminate for Convenience 68
16.04 Contractor May Stop Work or Terminate 68
Article 17—Final Resolution of Disputes 69
17.01 Methods and Procedures 69
Article 18—Miscellaneous 69
18.01 Giving Notice 69
18.02 Computation of Times 69

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

18.03 Cumulative Remedies 70
18.04 Limitation of Damages 70
18.05 No Waiver 70
18.06 Survival of Obligations 70
18.07 Controlling Law 70
18.08 Assignment of Contract 70
18.09 Successors and Assigns 70
18.10 Headings 70

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. Claim

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. Technical Data

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1.02 Terminology

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).

E. Furnish, Install, Perform, Provide

1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 Delivery of Performance and Payment Bonds; Evidence of Insurance

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 Copies of Documents

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 Before Starting Construction

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 Preconstruction Conference; Designation of Authorized Representatives

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 Acceptance of Schedules

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 Electronic Transmittals

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 Reference Standards

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. Resolving Discrepancies

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

   a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

   b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 Requirements of the Contract Documents

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 Reuse of Documents

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 Starting the Work

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 Reference Points

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 Progress Schedule

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 Delays in Contractor's Progress

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. Abnormal weather conditions;

3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

4. Acts of war or terrorism.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

1. The circumstances that form the basis for the requested adjustment;

2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 Availability of Lands

A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 Use of Site and Other Areas

A. Limitation on Use of Site and Other Areas

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 Subsurface and Physical Conditions

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

5.04 Differing Subsurface or Physical Conditions

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. Possible Price and Times Adjustments

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;

b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 Underground Facilities

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. Possible Price and Times Adjustments

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 Hazardous Environmental Conditions at Site

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 Insurance—General Provisions

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 Contractor's Insurance

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 Builder's Risk and Other Property Insurance

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 Property Losses; Subrogation

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

6.06 Receipt and Application of Property Insurance Proceeds

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 Contractor's Means and Methods of Construction

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 Supervision and Superintendence

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 Labor; Working Hours

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 Services, Materials, and Equipment

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 "Or Equals"

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that the proposed item:

1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) has a proven record of performance and availability of responsive service; and

4) is not objectionable to Owner.

b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 Substitutes

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

    a. will certify that the proposed substitute item will:

        1) perform adequately the functions and achieve the results called for by the general design;

        2) be similar in substance to the item specified; and

        3) be suited to the same use as the item specified.

    b. will state:

        1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

        2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

        3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

    c. will identify:

        1) all variations of the proposed substitute item from the item specified; and

        2) available engineering, sales, maintenance, repair, and replacement services.

    d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 Concerning Subcontractors and Suppliers

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 Patent Fees and Royalties

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

7.09 Permits

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 Taxes

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 Laws and Regulations

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 Record Documents

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

7.13 Safety and Protection

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 Hazard Communication Programs

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 Emergencies

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 Submittals

A. Shop Drawing and Sample Requirements

1. Before submitting a Shop Drawing or Sample, Contractor shall:

    a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

    b. determine and verify:

        1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

        2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

        3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

    c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. Shop Drawings

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. Samples

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. Engineer's Review of Shop Drawings and Samples

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. Resubmittal Procedures for Shop Drawings and Samples

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

    a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

    b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

    c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 Contractor's General Warranty and Guarantee

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

1. Observations by Engineer;

2. Recommendation by Engineer or payment by Owner of any progress or final payment;

3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 Indemnification

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 Delegation of Professional Design Services

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 Other Work

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 Coordination

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 Legal Relationships

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 Communications to Contractor

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 Replacement of Engineer

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 Furnish Data

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 Pay When Due

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

9.05 Lands and Easements; Reports, Tests, and Drawings

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 Insurance

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 Change Orders

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 Inspections, Tests, and Approvals

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 Limitations on Owner's Responsibilities

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 Undisclosed Hazardous Environmental Condition

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 Evidence of Financial Arrangements

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 Safety Programs

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 Owner's Representative

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 Visits to Site

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 Resident Project Representative

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 Engineer's Authority

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 Determinations for Unit Price Work

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 Decisions on Requirements of Contract Documents and Acceptability of Work

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 Limitations on Engineer's Authority and Responsibilities

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 Compliance with Safety Program

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 Amending and Supplementing the Contract

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (1) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 Change Orders

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 Work Change Directives

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 Field Orders

A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 Owner-Authorized Changes in the Work

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 Unauthorized Changes in the Work

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 Change of Contract Price

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:
   1. A mutually acceptable fixed fee; or
   2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
      a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
      b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
      c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
      d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
      e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
      f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

11.08 Change of Contract Times

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 Change Proposals

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. Change Proposal Procedures

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

    a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

    b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

    The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 Notification to Surety

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 Claims

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. Mediation

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.

5. Other costs consisting of the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. Construction Equipment Rental

1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. Contractor's Fee

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. Adjustments in Unit Price

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

    a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

    b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 Access to Work

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 Tests, Inspections, and Approvals

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 Defective Work

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs,

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 Uncovering Work

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 Owner May Stop the Work

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. Applications for Payments

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

   b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

    a. to supervise, direct, or control the Work;

    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

    d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or

    e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

    a. the Work is defective, requiring correction or replacement;

    b. the Contract Price has been reduced by Change Orders;

    c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

    d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

    e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. Payment Becomes Due

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. Reductions in Payment by Owner

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

    a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. The Contract Price has been reduced by Change Orders;

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 Substantial Completion

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 Partial Use or Occupancy

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 Final Inspection

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 Final Payment

A. Application for Payment

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

2. The final Application for Payment must be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

d. a list of all duly pending Change Proposals and Claims; and

e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 Waiver of Claims

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 Correction Period

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;
2. correct such defective Work;
3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 Owner May Terminate for Cause

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects,

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 Owner May Terminate for Convenience

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 Contractor May Stop Work or Terminate

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 Methods and Procedures

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 Giving Notice

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 Computation of Times

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

18.03 Cumulative Remedies

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 Limitation of Damages

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 No Waiver

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 Survival of Obligations

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 Controlling Law

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 Assignment of Contract

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 Successors and Assigns

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 Headings

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

Page

Article 1— Definitions and Terminology 1
Article 2— Preliminary Matters 1
Article 4— Commencement and Progress of the Work 5
Article 5— Site, Subsurface and Physical Conditions, Hazardous Environmental Conditions 5
Article 6— Bonds and Insurance 5
Article 7— Contractor's Responsibilities 9
Article 10— Engineer's Status During Construction 10
Article 13— Cost of Work; Allowances, Unit Price Work 11
Article 15— Payments to Contractor, Set Offs; Completions; Correction Period 12
Article 17— Final Resolutions of Disputes 13
Exhibit A— Software Requirements for Electronic Document Exchange 15

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, “Paragraph SC-4.05.”

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

SC-1.01.A.3. Add the following language to the end of Paragraph 1.01.A.3:

The Application for Payment form to be used on this Project is included in Division I, EJCDC C-620.

SC-1.01.A.8. Add the following language to the end of Paragraph 1.01.A.8:

The Change Order form to be used on this Project is included in Division I, EJCDC C- 941.

SC-1.01.A.23. Add the following language to the end of Paragraph 1.01.A.23:

The Field Order form to be used on this Project is included in Division I, EJCDC C-942.

SC-1.01.A.42. Add the following language to the end of Paragraph 1.01.A.42:

The Certificate of Substantial Completion form to be used on this Project is included in Division I, EJCDC C-625.

SC-1.01.A.50. Add the following language to the end of Paragraph 1.01.A.50:

The Work Change Directive form to be used on this Project is included in Division I, EJCDC C-940.

ARTICLE 2—PRELIMINARY MATTERS

SC-2.02 Amend the first sentence of Paragraph 2.02.A. to read as follows:
Owner shall furnish to Contractor **one** printed copies of the Contract Documents (including one fully signed counterpart of the Agreement), and **one copy** in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

SC-2.03.A.4. Add a new paragraph immediately after Paragraph 2.03.A.3 of the General Conditions which is to read as follows:

1. a schedule (list) of construction equipment with hourly rates, owned or rented by the CONTRACTOR and all Subcontractors that will be used in the performance of the Work. The equipment schedule will include information necessary to confirm the hourly rates per Paragraph 13.01.B.5.c of the General Conditions and these Supplementary Conditions including: make, model, and year of manufacture as well as the horse power, capacity or weight, and accessories.

2.06 *Electronic Transmittals*

SC-2.06 Delete Paragraphs 2.06.B and 2.06.C in their entirety and insert the following in their place:

B. *Electronic Documents Protocol:* The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol ("EDP" or "Protocol") for exchange of electronic transmittals.

1. Basic Requirements

a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.

b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.

c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.

d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.

e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.

1) Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. *System Infrastructure for Electronic Document Exchange*

a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.

1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is 15 MB. Attachments larger than that may be exchanged using large file transfer functions or physical media.

2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.

b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.

c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.

d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.

f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.

g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to complete the communication.

C. Software Requirements for Electronic Document Exchange; Limitations

1. Each party will acquire the software and software licenses necessary to create and transmit Electronic Documents and to read and to use any Electronic Documents received from the other party (and if relevant from third parties), using the software formats required in this section of the EDP.

   a. Prior to using any updated version of the software required in this section for sending Electronic Documents to the other party, the originating party will first notify and receive concurrence from the other party for use of the updated version or adjust its transmission to comply with this EDP.

2. The parties agree not to intentionally edit, reverse engineer, decrypt, remove security or encryption features, or convert to another format for modification purposes any Electronic Document or information contained therein that was transmitted in a software data format, including Portable Document Format (PDF), intended by sender not to be modified, unless the receiving party obtains the permission of the sending party or is citing or quoting excerpts of the Electronic Document for Project purposes.

3. Software and data formats for exchange of Electronic Documents will conform to the requirements set forth in Exhibit A to this EDP, including software versions, if listed.

SC-2.06 Supplement Paragraph 2.06 of the General Conditions by adding the following paragraph:

D. Requests by Contractor for Electronic Documents in Other Formats

1. Release of any Electronic Document versions of the Project documents in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be at the sole discretion of the Owner.

2. To extent determined by Owner, in its sole discretion, to be prudent and necessary, release of Electronic Documents versions of Project documents and other Project information requested by Contractor ("Request") in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be subject to the provisions of the Owner's response to the Request, and to the following conditions to which Contractor agrees:

   a. The content included in the Electronic Documents created by Engineer and covered by the Request was prepared by Engineer as an internal working document for Engineer's purposes solely, and is being provided to Contractor on an "AS IS" basis without any warranties of any kind, including, but not limited to any implied warranties of fitness for any purpose. As such, Contractor is advised and acknowledges that the content may not be suitable for Contractor's application, or

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

may require substantial modification and independent verification by Contractor. The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.

b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Engineer to Contractor under the request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor's sole risk and the Contractor waives any claims against Engineer or Owner arising from use of data in Electronic Documents covered by the Request.

c. Contractor shall indemnify and hold harmless Owner and Engineer and their subconsultants from all claims, damages, losses, and expenses, including attorneys' fees and defense costs arising out of or resulting from Contractor's use, adaptation, or distribution of any Electronic Documents provided under the Request.

d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Engineer, unless such distribution is specifically identified in the Request and is limited to Contractor's subcontractors. Contractor warrants that subsequent use by Contractor's subcontractors complies with all terms of the Contract Documents and Owner's response to Request.

3. In the event that Owner elects to provide or directs the Engineer to provide to Contractor any Contractor-requested Electronic Document versions of Project information that is not explicitly identified in the Contract Documents as being available to Contractor, the Owner shall be reimbursed by Contractor on an hourly basis (at $**120** per hour) for any engineering costs necessary to create or otherwise prepare the data in a manner deemed appropriate by Engineer.

ARTICLE 3— CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

SC-3.01 Delete Paragraph 3.01.C in its entirety and insert the following in its place**.**

Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the Owner's electronic version will govern.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

SC-4.01.A. Delete Paragraph 4.01.A in its entirety and insert the following in its place:

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty (30) days after the Effective Date of the Agreement.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 5—SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

SC-5.03 Add the following new paragraphs immediately after Paragraph 5.03.D:

E. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data, and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
Final Report on Well 9 Groundwater Exploration Project	August 2022	Well 9 Drilling Data and Logs
Geotechnical Investigation – HSR Well House	December 2025	Soil test pit logs and recommendations – See Specification Section 01 11 00 for report.

ARTICLE 6—BONDS AND INSURANCE

SC-6.01.A. Delete Paragraph 6.01.A in its entirety and insert the following in its place:

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to **125% of the Contract Price**, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.B:

1. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be 2 years after Substantial Completion.

2. After Substantial Completion, Contractor shall furnish a warranty bond issued in the form of EJCDC® C-612, Warranty Bond (2018). The warranty bond must be in a bond amount of **50** percent of the final Contract Price. The warranty bond period will extend to a date **2** years after Substantial Completion of the Work. Contractor shall deliver the fully executed warranty bond to Owner prior to or with the final application for payment, and in any event no later than 11 months after Substantial Completion.

3. The warranty bond must be issued by the same surety that issues the performance bond required under Paragraph 6.01.A of the General Conditions.

SC-6.01 Add the following new paragraphs immediately after Paragraph 6.01.H:

A. All bonds issued for the contract shall guarantees the faithful performance of the prevailing hourly wage clause as required by Wyoming statute.

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

D. *Other Additional Insureds:* As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess,

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following: **Nelson Engineering, JHHR Holdings I, LLC & Teton County, WY**

E. *Workers' Compensation and Employer's Liability:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Bodily Injury, each accident	$1,000,000
Bodily injury by disease, each employee	$1,000,000
Bodily injury/ disease aggregate	$1,000,000

F. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,
2. damages insured by reasonably available personal injury liability coverage, and
3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage.
    a. Such insurance must be maintained for three years after final payment.
    b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
4. Underground, explosion, and collapse coverage.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

5. Personal injury coverage.

6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

H. *Commercial General Liability—Excluded Content:* The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).

2. Any exclusion for water intrusion or water damage.

3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.

4. Any exclusion of coverage relating to earth subsidence or movement.

5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).

6. Any limitation or exclusion based on the nature of Contractor's work.

7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	**Policy limits of not less than:**
General Aggregate	$2,000,000
Products—Completed Operations Aggregate	$1,000,000
Personal and Advertising Injury	$1,000,000
Bodily Injury and Property Damage—Each Occurrence	$1,000,000

J. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	**Policy limits of not less than:**
Bodily Injury	
Each Person	$500,000
Each Accident	$1,000,000

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

Automobile Liability	Policy limits of not less than:
Property Damage	
Each Accident	$500,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$1,000,000

K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$2,000,000
General Aggregate	$4,000,000

L. *Contractor's Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	$1,000,000
General Aggregate	$2,000,000

6.01 Builder's Risk and Other Property Insurance

SC-6.04 Delete Paragraph 6.04.A of the General Conditions and substitute the following in its place:

A. Installation Floater

1. Contractor shall provide and maintain installation floater insurance on a broad form or "all risk" policy providing coverage for materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work ("Covered Property"). Coverage under the Contractor's installation floater will include loss from covered "all risk" causes (perils) to Covered Property:
    a. of the Contractor, and Covered Property of others that is in Contractor's care, custody, and control;
    b. while in transit to the Site, including while at temporary storage sites;
    c. while at the Site awaiting and during installation, erection, and testing;
    d. continuing at least until the installation or erection of the Covered Property is completed, and the Work into which it is incorporated is accepted by Owner.
2. The installation floater coverage cannot be contingent on an external cause or risk, or limited to property for which the Contractor is legally liable.
3. The installation floater coverage will be in an amount sufficient to protect Contractor's

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

interest in the Covered Property. The Contractor will be solely responsible for any deductible carried under this coverage.

4. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

SC- 7.03 Labor; Working Hours

SC-7.03 Add the following new paragraphs immediately after Paragraph 7.03.D:

D. Contractor shall be responsible for compliance with all the requirements of the Special Conditions, and any state or federal law, and provide all necessary documentation.

SC-7.04 Add the following new paragraphs immediately after Paragraph 7.04.C:

D. Contractor shall be responsible for compliance with all the requirements of the Special Conditions, and any state or federal law, and provide all necessary documentation.

SC-7.07 Concerning Subcontractors, Suppliers, and Others

SC-7.07.A. Add a new sentence at the end of Paragraph 7.07.A of the General Conditions which is to read as follows:

Contractor shall not award Work to Subcontractor(s) in excess of 50% of the Contract Price without prior written approval of Owner.

SC-7.07 Add the following new paragraphs immediately after Paragraph 7.07.M::

N. Contractor shall incorporate all terms required by the Special Conditions and any state or federal law in any contract for Subcontractors and Suppliers.

SC-7.11.D Add the following paragraph after 7.11.C. in the General Conditions:

D. Each and every provision of law and clause required by law to be inserted in the Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or is not correctly inserted, then upon application of either party, the Contract shall forthwith be physically amended in writing to make such insertion or correction.

Contractor shall comply with all Wyoming Statutes dealing with public works projects, including but not limited to, W.S. 16-6-101 through -121, 16-6-201 through-206, 16-6-701 through -708, 16-6-1001, and 15-1-113. Contractor shall also comply with all applicable federal laws and regulations.

Contractor shall comply with the following:

1. Wyoming Statute 16-6-121(f), which requires Contractor to post on the construction site a prominent sign citing Wyoming Statute 16-6-121(f) and stating that any subcontractor or materialman shall give notice to the prime contractor of a right to protection under the bond or guarantee and that failure to provide the notice shall waive the subcontractor or materialman's protection under the

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

bond or guarantee and shall waive any right to a lien for materials or services provided.

2. Wyoming Workmen's Compensation Act
3. Prevailing Wages, Wyoming Statute 24-4-401 *et seq*.
4. Wage Payment Bond, Wyoming Statute 27-1-106 (2013 Edition)
5. Wyoming Preference Act of 1971. (Wyoming Statute 16-6-201 through 206)
6. Funding is subject to Uniform Administrative Requirements of 2 C.F.R. Part 200, *et seq.,* any additional requirements set forth by the U.S. Department of the Treasury; all applicable regulations published pursuant to section 602 and 603 of the Social Security Act; 31 C.F.R. Part 35; and all guidance issued by Treasury regarding the foregoing. The Contractor shall take all necessary actions to comply with all requirements for the use of these federal funds.

ARTICLE 8 OTHER WORK AT THE SITE

SC-8.02 Add the following new Paragraph 8.02.C immediately after Paragraph 8.02.B:

C. Owner intends to contract with others for the performance of other work at or adjacent to the Site.
   1. Town Engineering shall have authority and responsibility for coordination of the various contractors and work forces at the Site;
   2. The following specific matters are to be covered by such authority and responsibility: Coordination of Well House and Well Completion and West Jackson Transmission
   3. The extent of such authority and responsibilities is: As necessary.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.03 *Resident Project Representative*

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:
   1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.
   2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.
   3. *Liaison*
      a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's On-Site operations.

c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.

4. Review of Work; Defective Work

a. Conduct On-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.

b. Observe whether any Work in place appears to be defective.

c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.

5. Inspections and Tests

a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.

b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.

6. *Payment Requests:* Review Applications for Payment with Contractor.

7. Completion

a. Participate in Engineer's visits regarding Substantial Completion.

b. Assist in the preparation of a punch list of items to be completed or corrected.

c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.

d. Observe whether items on the final punch list have been completed or corrected.

D. The RPR will not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.

5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Authorize Owner to occupy the Project in whole or in part.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 13—COST OF WORK; ALLOWANCES, UNIT PRICE WORK

13.01 *Cost of the Work*

13.01.B.5.c Construction Equipment Rental

13.01.B.5.c.1) Add a new sentence at the end of Paragraph 13.01.B.5.c.1) of the General Conditions which is to read as follows:

Transportation costs will not be included for equipment already on the Site which is being used for other portions of the Work.

13.01.B.5.c.2) Delete Paragraph 13.01.B.5.c.2) of the General Conditions in its entirety and insert the following in its place:

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the approved rate schedule submitted according to SC 2.03 or will be calculated from the Rental Rate Blue Book for Construction. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs. For equipment on standby, the hourly rate shall be 50% of the monthly rental hourly rate divided by 176 hours per month, and the hourly operating cost shall not be applied.

13.03 *Unit Price Work*

SC-13.03.E Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. Adjustments in Unit Price

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

   a. the extended price of a particular item of Unit Price Work amounts to fifteen percent (15%) or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than thirty percent (30%) from the estimated quantity of such item indicated in the Agreement; and

   b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 15—PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

15.01 *Progress Payments*

SC-15.01.B Applications for Payments

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

SC-15.01.B.1. Delete the first sentence of Paragraph 15.01.B.1. of the General Conditions in its entirety and insert the following in its place:

15.01.B.1. On or before the last day of each month, the Contractor shall submit to the Engineer for review an Application for Payment filled out and signed by the Contractor covering the work completed as of the date of application and accompanied by such supporting documentation as is required by the Contract Documents and also as Engineer may reasonably require.

SC-15.01.D Payment Becomes Due

SC-15.01.D.1. Delete Paragraph 15.01.D.1. of the General Conditions in its entirety and insert the following in its place:

15.01.D.1. Thirty days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 15.01.E) become due, and when due will be paid by Owner to Contractor.

SC-15.06 Final Payment

SC-15.06.E. Delete Paragraph 15.06.E of the General conditions in its entirety and insert the following in its place:

15.06.E. *Final Payment Becomes Due*: Ten days after receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall, in accordance with Wyoming Statute 16-6-116 notice and issue final payment for completed work, including the 40 day notice period.

SC-15.08 Add the following new Paragraph 15.08.G:

G. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be the number of years set forth in SC-6.01.B.1; or if no such revision has been made in SC-6.01.B, then the correction period is hereby specified to be **2** years after Substantial Completion.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

SC-17.01 Methods and Procedures

SC-17.01B. Add a new paragraph immediately after Paragraph 17.01.B of the General Conditions which is to read as follows:

C. If a dispute resolution agreement has not been reached, then all claims, counterclaims, disputes, and other matters in question between the Owner and Contractor arising out of or relating to the Contract Documents or the breach thereof, will be decided in a court of competent jurisdiction in Teton County in the State of Wyoming.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

ARTICLE 18—MISCELLANEOUS

18.07 Controlling Law

SC-18.07.A Replace the sentence of Paragraph 18.07.A of the General Conditions in its entirety and insert the following two paragraphs in its place:

18.07.A This Contract shall be constructed, performed and enforced in accordance with, and governed by, the laws of the State of Wyoming, without giving effect to the principles ofconflict of laws thereof. The Parties hereto irrevocably elect as the sole judicial forum for the adjudication of any matters arising under or in connection with this Contract, and consent to the jurisdiction of, the courts of the County of Teton, State of Wyoming, or the United States of America for the District of Wyoming. This Contract was negotiated by both parties hereto and thus it shall not be construed against or in favor of any party by virtue of which party drafted it or any portion thereof.

18.07.B The Town of Jackson does not waive its governmental or sovereign immunity by entering into this Contract, and fully retains all immunities and defenses provided by law with respect to any action based on or occurring as a result of this Contract.

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

EXHIBIT A—SOFTWARE REQUIREMENTS FOR ELECTRONIC DOCUMENT EXCHANGE

Item	Electronic Documents	Transmittal Means	Data Format	Note (1)
a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contactors Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner's and Engineer's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE	DWG	
a.6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE	DB	

Notes	
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.

Key	
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive)
PDF	Portable Document Format readable by Adobe® Acrobat Reader Version **[2017]** or later
DWG	Autodesk® AutoCAD .dwg format Version **[2018]**
DOC	Microsoft® Word .docx format Version **[2016]**
EXC	Microsoft® Excel .xls or .xml format Version **[2016]**
DB	Microsoft® Access .mdb format Version **[number]**

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

SECTION II

SUPPLEMENTAL CONTRACT FORMS

NOTICE OF AWARD

Date of Issuance:			
Owner:	Town of Jackson, WY	Owner's Project No.:	26-06
Engineer:	Nelson Engineering	Engineer's Project No.:	23-302-02
Project:	2025 High School Road Pump House		
Contract Name:	2025 High School Road Pump House		
Bidder:			
Bidder's Address:			

You are notified that Owner has accepted your Bid dated _____for the above Contract, and that you are the Successful Bidder and are awarded a Contract for:

The **2025 High School Road Pump House** project in Jackson, Wyoming.

The Contract Price of the awarded Contract is _____. Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

One (1) unexecuted counterpart of the Agreement accompanies this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner **one (1)** counterpart of the Agreement, signed by Bidder (as Contractor).
2. Deliver with the signed Agreement the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.
3. Other conditions precedent (if any):
    a. Contractor to provide Project Schedule 8 days prior to preconstruction meeting.
    b. Contractor to provide labor and equipment rate schedule 8 days prior to the preconstruction meeting.
    c. Contractor to provide List of Subcontractors and Suppliers, if changed from bid.
4. Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: Town of Jackson, WY.
By (signature): _____
Name (printed): _____
Title: _____

Copy: Engineer

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

NOTICE TO PROCEED

Owner:	Town of Jackson	Owner's Project No.:	26-06
Engineer:	Nelson Engineering	Engineer's Project No.:	23-302-02
Contractor:		Contractor's Project No.:	
Project:	2025 High School Road Pump House		
Contract Name:	2025 High School Road Pump House		
Effective Date of Contract:			

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on **[*date Contract Times are to start*]** pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement:

The date by which **Substantial** and **Final Completion** must be achieved is stipulated in the **Agreement between Owner and Contractor for Construction Contract**.

Before starting any Work at the Site, Contractor must comply with the following:

Owner:	**Town of Jackson**
By *(signature)*:	
Name *(printed)*:	Brian Lenz
Title:	Town of Jackson Engineer
Date Issued:	

Copy: Engineer

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner:	Town of Jackson	Owner's Project No.:	26-06
Engineer:	Nelson Engineering	Engineer's Project No.:	23-302-02
Contractor:	**[contractor]**	Contractor's Project No.:	
Project:	2025 High School Road Pump House		
Contract Name:	2025 High School Road Pump House		
Date Issued:	**[date]**	Effective Date of Work Change Directive:	**[date]**

Contractor is directed to proceed promptly with the following change(s):

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

Notes to User—Check one or both of the following

☐ Non-agreement on pricing of proposed change. ☐ Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: $ _____ **[increase] [decrease] [not yet estimated]**.

Contract Time: _____ days **[increase] [decrease] [not yet estimated]**.

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

	Recommended by Engineer	Authorized by Owner
By:		
Title:		
Date:		

EJCDC® C-940, Work Change Directive.
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

CHANGE ORDER NO.: [Number of Change Order]

Owner:	Town of Jackson	Owner's Project No.:	26-06
Engineer:	Nelson Engineering	Engineer's Project No.:	23-302-02
Contractor:	**[contractor]**	Contractor's Project No.:	**[xxxxx]**
Project:	2025 High School Road Pump House		
Contract Name:	2025 High School Road Pump House		
Date Issued:	**[date]**	Effective Date of Change Order:	**[date]**

The Contract is modified as follows upon execution of this Change Order:

Description:

[Description of the change]

Attachments:

[List documents related to the change]

Change in Contract Price	**Change in Contract Times [State Contract Times as either a specific date or a number of days]**
Original Contract Price: $	Original Contract Times: Substantial Completion: Ready for final payment:
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. **[Number of previous Change Order]**: $	**[Increase] [Decrease]** from previously approved Change Orders No.1 to No. **[Number of previous Change Order]**: Substantial Completion: Ready for final payment:
Contract Price prior to this Change Order: $	Contract Times prior to this Change Order: Substantial Completion: Ready for final payment:
[Increase] [Decrease] this Change Order: $	**[Increase] [Decrease]** this Change Order: Substantial Completion: Ready for final payment:
Contract Price incorporating this Change Order: $	Contract Times with all approved Change Orders: Substantial Completion: Ready for final payment:

Recommended by Engineer (if required)	Accepted by Contractor
By: _____	_
Title: _____	_
Date: _____	_
Authorized by Owner	Approved by Funding Agency (if applicable)
By: _____	_
Title: _____	_
Date: _____	_

EJCDC® C-941, Change Order EJCDC® C-941, Change Order, Rev.1.
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies and American Society of Civil Engineers. All rights reserved.

FIELD ORDER NO.: [Number of Field Order]

Owner:	Town of Jackson	Owner's Project No.:	26-06
Engineer:	Nelson Engineering	Engineer's Project No.:	23-302-02
Contractor:	**[contractor]**	Contractor's Project No.:	**[xxxxx]**
Project:	2025 High School Road Pump House		
Contract Name:	2025 High School Road Pump House		
		Effective Date of Field Order:	
Date Issued:	**[date]**		**[date]**

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies and American Society of Civil Engineers. All rights reserved.

CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:	Town of Jackson	Owner's Project No.:	26-06
Engineer:	Nelson Engineering	Engineer's Project No.:	23-302-02
Contractor:		Contractor's Project No.:	
Project:	2025 High School Road Pump House		
Contract Name:	2025 High School Road Pump House		

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: **[Enter date, as determined by Engineer]**

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

EJCDC® C-625, Certificate of Substantial Completion.
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

NOTICE OF ACCEPTABILITY OF WORK

Owner:	Town of Jackson	Owner's Project No.:	26-06
Engineer:	Nelson Engineering	Engineer's Project No.:	23-302-02
Contractor:	**[contractor]**	Contractor's Project No.:	
Project:	2025 High School Road Pump House		
Contract Name:	2025 High School Road Pump House		

Notice Date: [**date]**

Effective Date of the Construction Contract: **[date]**

The Engineer hereby gives notice to the Owner and Contractor that Engineer recommends final payment to Contractor, and that the Work furnished and performed by Contractor under the Construction Contract is acceptable, expressly subject to the provisions of the Construction Contract's Contract Documents ("Contract Documents") and of the Agreement between Owner and Engineer for Professional Services dated **[date of professional services agreement]** ("Owner-Engineer Agreement"). This Notice of Acceptability of Work (Notice) is made expressly subject to the following terms and conditions to which all who receive and rely on said Notice agree:

1. This Notice has been prepared with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. This Notice reflects and is an expression of the Engineer's professional opinion.
3. This Notice has been prepared to the best of Engineer's knowledge, information, and belief as of the Notice Date.
4. This Notice is based entirely on and expressly limited by the scope of services Engineer has been employed by Owner to perform or furnish during construction of the Project (including observation of the Contractor's Work) under the Owner-Engineer Agreement, and applies only to facts that are within Engineer's knowledge or could reasonably have been ascertained by Engineer as a result of carrying out the responsibilities specifically assigned to Engineer under such Owner-Engineer Agreement.
5. This Notice is not a guarantee or warranty of Contractor's performance under the Construction Contract, an acceptance of Work that is not in accordance with the Contract Documents, including but not limited to defective Work discovered after final inspection, nor an assumption of responsibility for any failure of Contractor to furnish and perform the Work thereunder in accordance with the Contract Documents, or to otherwise comply with the Contract Documents or the terms of any special guarantees specified therein.
6. This Notice does not relieve Contractor of any surviving obligations under the Construction Contract, and is subject to Owner's reservations of rights with respect to completion and final payment.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.

SECTION III

SPECIFICATIONS

SPECIFICATIONS

TOWN OF JACKSON

2025 HIGH SCHOOL ROAD
PUMP HOUSE

PREPARED BY:
NELSON ENGINEERING
430 SOUTH CACHE STREET
P.O. BOX 1599
JACKSON, WY 83001
307-733-2087

JOSH KILPATRICK, WY PE 12741
PROJECT MANAGER

PROJECT NO. 23-302-02

AUGUST 2025

SET NO. _____

TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

01 11 00	**SUMMARY OF WORK**	
	HSR PUMP HOUSE SOIL REPORT	
01 27 00	**MEASUREMENT & PAYMENT PROCEEDURES**	
01 31 00	**PROJECT MANAGEMENT & COORDINATION**	
01 32 16	**CONSTRUCTION SCHEDULE**	
01 32 33	**PHOTOGRAPHIC AND VIDEO DOCUMENTATION**	
01 33 23	**SUBMITTAL PROCEDURES**	
	LIST OF MATERIAL SUBMITTALS	
01 35 23	**SAFETY REQUIREMENTS**	
01 40 00	**QUALITY REQUIREMENTS**	
01 50 00	**TEMPORARY FACILITIES AND CONTROLS**	
01 55 26	**TRAFFIC CONTROL**	
01 57 19.12	**NOISE & ACOUSTICS MANAGEMENT**	
01 67 00	**PRODUCT REQUIREMENTS**	
01 71 13	**MOBILIZATION**	
01 73 40	**EXECUTION**	
01 77 00	**CLOSEOUT PROCEDURES**	
01 78 23	**OPERATION AND MAINTENANCE DATA**	
01 79 00	**DEMONSTRATION AND TRAINING**	
01 91 14	**COMMISSIONING**	
	CLOSEOUT AND OPERATION & MAINTENANCE REQUIREMENTS	
01 95 00	**FORCE ACCOUNT**	

DIVISION 03 – CONCRETE

03 30 00	**CAST-IN-PLACE CONCRETE**	
03 37 00	**CONCRETE CURING**	
03 60 00	**GROUTING**	

DIVISION 05 – METALS

05 50 00	**METAL FABRICATIONS**	
05 50 10	**ANCHOR BOLTS AND EXPANSION ANCHORS**	

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

06 10 00	**ROUGH CARPENTRY**	
06 16 00	**SHEATHING**	

DIVISION 07 – THERMAL & MOISTURE PROTECTION

07 11 13	**BITUMINOUS DAMPPROOFING**	
07 13 26	**SELF-ADHERING SHEET WATERPROOFING**	
07 25 00	**WEATHER BARRIERS**	
07 26 00	**VAPOR RETARDERS**	
07 62 00	**SHEET METAL FLASHING & TRIM**	
07 92 00	**JOINT SEALANTS**	

DIVISION 08 – OPENINGS

08 11 13	HOLLOW METAL DOORS	
08 33 23	OVERHEAD COILING DOORS	
08 51 13	ALUMINUM WINDOWS	
08 71 00	DOOR HARDWARE	
08 80 00	GLAZING	

DIVISION 09 – FINISHES

09 29 00	GYPSUM BOARD	
09 91 13	EXTERIOR PAINTING	
09 91 23	INTERIOR PAINTING	
09 96 00	HIGH-PERFORMANCE COATINGS	

DIVISION 22 – PLUMBING

22 00 00	GENERAL PROVISIONS FOR PLUMBING WORK	
22 00 10	PENETRATION FIRESTOPPING FOR PLUMBING	
22 05 17	SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING	
22 05 23	VALVES FOR PLUMBING PIPING	
22 05 29	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT	
22 05 48	VIBRATION & SEISMIC CONTROLS FOR PLUMBING PIPING & EQUIP.	
22 05 48	IDENTIFICATION FOR PLUMBING PIPING & EQUIPMENT	
22 07 19	PLUMBING PIPING INSULATION	
22 11 16	DOMESTIC WATER PIPING	
22 11 19	DOMESTIC WATER PIPING SPECIALTIES	
22 13 00	FIRE SUPPRESSION SPRINKLER SYSTEM	
22 13 15	FIRE SPRINKLER PIPE	
22 13 16	SANITARY WASTE AND VENT PIPING	
22 13 19	SANITARY WASTE PIPING SPECIALTIES	

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING

23 00 00	GENERAL PROVISIONS FOR HVAC WORK	
23 05 13	COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT	
23 05 29	HANGERS & SUPPORTS FOR HVAC PIPING & EQUIPMENT	
23 05 48	VIBRATION AND SEISMIC CONTROLS FOR HVAC	
23 05 53	IDENTIFICATION FOR HVAC PIPING & EQUIPMENT	
23 05 93	TESTING, ADJUSTING & BALANCING FOR HVAC	
23 07 13	DUCT INSULATION	
23 08 00	COMMISSIONING OF HVAC EQUIPMENT	
23 23 00	REFRIGERENT PIPING	
23 31 13	METAL DUCTS	
23 31 16	NONMETAL DUCTS	
23 34 23	HVAC POWER VENTILATORS	
23 81 26	SPLIT SYSTEM AIR CONDITIONERS	
23 82 19	FAN COIL UNITS	
23 82 39.19	ELECTRIC WALL AND CEILING UNIT HEATERS	

DIVISION 25 – INTEGRATED AUTOMATION

25 30 00	INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS.....
25 51 00	INTEGRATED AUTOMATION CONTROL OF FACILITY EQUIPMENT .....

DIVISION 26 – ELECTRICAL

26 00 00	BASIC ELECTRICAL REQUIREMENTS .....
26 05 19	LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES .....
26 05 23	CONTROL-VOLTAGE ELECTRICAL POWER CABLES .....
26 05 26	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.....
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS.....
26 05 33	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS .....
26 05 43	UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS....
26 05 44	SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS & CABLING
26 05 48	VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS .....
26 05 53	IDENTIFICATION FOR ELECTRICAL SYSTEMS.....
26 09 23	LIGHTING CONTROL DEVICES.....
26 22 00	LOW-VOLTAGE TRANSFORMERS.....
26 23 00	LOW-VOLTAGE SWITCHGEAR .....
26 24 16	PANELBOARDS .....
26 27 26	WIRING DEVICES.....
26 28 13	FUSES.....
26 28 16	ENCLOSED SWITCHES AND CIRCUIT BREAKERS .....
26 29 23	VARIABLE-FREQUENCY MOTOR CONTROLLERS.....
26 32 13	ENGINE GENERATORS.....
26 51 00	BUILDING LIGHTING .....

DIVISION 31 – EARTHWORK

31 05 13	SOILS FOR EARTHWORK.....
31 05 16	AGGREGATES FOR EARTHWORK.....
31 10 00	SITE CLEARING.....
31 23 16	EXCAVATION.....
31 23 17	TRENCHING.....
31 23 19	DEWATERING .....
31 23 23	FILL.....
31 23 24	FLOWABLE FILL.....

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 12 16	ASPHALT PAVING.....
32 80 00	LANDSCAPE IRRIGATION .....
32 91 19.13	TOPSOIL PLACEMENT & GRADING.....
32 92 23	SODDING.....
32 93 00	PLANTING.....

DIVISION 33 – UTILITIES

33 11 33	PUBLIC WATER DISTRIBUTION PIPING.....
33 12 13	WATER SERVICE CONNECTIONS.....

33 12 16 WATER UTILITY DISTRIBUTION VALVES.....
33 13 00 DISINFECTING OF WATER UTILITY DISTRIBUTION .....
33 21 13 PUBLIC WATER SUPPLY WELLS .....

DIVISION 40 – PROCESS INTEGRATION

40 05 13 COMMON WORK RESULTS FOR PROCESS PIPING.....
40 05 13.53 DUCTILE IRON PROCESS PIPING .....
40 05 13.73 PLASTIC PROCESS PIPING.....
40 05 23 COMMON WORK RESULTS FOR PROCESS VALVES.....
40 05 23.12 BALL VALVES .....
40 05 23.15 GATE VALVES.....
40 05 23.24 CHECK VALVES .....
40 05 23.72 MISCELLANEOUS PROCESS VALVES.....
40 05 29 HANGERS AND SUPPORTS FOR PROCESS PIPING AND EQUIPMENT .....
40 05 48 VIBRATION AND SEISMIC CONTROLS FOR PROCESS PIPING.....
40 05 53 IDENTIFICATION FOR PROCESS PIPING .....
40 23 19 PROCESS PLANT WATER PIPING .....

DIVISION 43 – PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE EQUIPMENT

43 21 13 CENTRIFUGAL LIQUID PUMPS .....

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

46 05 53 IDENTIFICATION FOR WATER AND WASTEWATER EQUIPMENT .....
46 31 11 CHLORINE GAS FEED EQUIPMENT .....
46 33 44 PERISTALTIC METERING PUMPS .....

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Work phases.
3. Work under other contracts.
4. Contractor use of premises.
5. Public use of site.
6. Occupancy requirements for buildings.
7. Work Restrictions.
8. Special Construction Requirements.
9. Protection of Parks and Public Lands.
10. Soils Investigation Report.
11. Additional Reports.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Location: East of the intersection of Rangeview Drive and High School Road, Jackson WY 83001

B. The Work consists of the following:

1. The Work includes construction of the High School Road Pump House facility included building, electrical, backup genset, treatment, mechanical, and disinfection equipment. Also included is completion of two public water supply wells.

C. Project will be constructed under a single prime contract.

1.3 WORK PHASES

A. The Work shall be completed in phases established by Contractor's schedule and approved by Engineer. In accordance with the plans, scheduling of work shall be closely coordinated with WWTP operations.

1.4 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on other contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts at or near the Project Site.

1.5 CONTRACTOR USE OF SITE

A. General: Contractor shall have limited use of the site for construction operations. Limit use of premises to areas within the construction limits indicated on the drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated. Construction limits are defined by the "Limit of Disturbance" boundary shown in the Construction Drawings.

B. Coordinate with Engineering and ToJ water system Operators to minimize disruptions in water service. Inform construction workers and supervisors about the special conditions established by Engineer and/ or ToJ Operators that may affect operations of immediate or remote water supply and storage facilities.

C. Maximize the use of previously disturbed areas for staging and stockpile areas to minimize ground disturbance.

D. Storage of Materials: Confine storage of materials to storage within the limits of disturbance shown on the drawings.

E. Preservation of Existing Features:

1. Prevent damage to surroundings located outside construction limits. Restore damaged areas; repairing or replacing damaged landscaping, pavement, sidewalk, buildings shall be done at no additional expense to the Owner.
2. Coordinate removal of hardscapes with Owner/Engineer.
3. Obtain permission from Owner for tree removal within the construction limits.
4. Provide temporary barriers to protect existing trees and plants and root zones.
5. Do not remove, injure, or destroy trees or other plants without prior approval.
6. Do not fasten ropes, cables, or guys to existing trees.
7. Carefully supervise excavating, grading, filling, and other construction operations near trees to prevent damage.

F. Driveways and Entrances: Keep driveways, parking lots, and roadways serving premises clear and available to ToJ employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials unless otherwise indicated or approval is given by Owner/Engineer.

1. Schedule deliveries to minimize use of driveways and entrances.
2. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

G. Construction Camp: Camps are <u>not</u> be permitted. Contractor shall procure housing for personnel offsite.

H. Hauling Restrictions: Comply with all legal load restrictions in the hauling of materials.

I. Fuel Storage: Fuel Storage in excess of 25 gallons is not permitted onsite.

1.6 PUBLIC USE OF SITE

A. Contractor shall at all times conduct his operations to ensure the least inconvenience to the public and ToJ personnel. If excavation, backfill, or paving operations require a temporary closure of a

street or vehicular access to the ToJ, the Contractor shall coordinate closure with Owner/Engineer and/or route traffic on a clearly signed and marked detour. The Contractor will be required to place and maintain signs for all detours.

1.7 OCCUPANCY REQUIREMENTS FOR BUILDINGS AND PREMISES

A. Pump House
   1. Maintain access to Engineer and Owner to inspect work.

1.8 LOCATING UTILITIES

A. Comply with Section 01 73 40 – Execution, for location and verification of existing utilities.

1.9 WORK RESTRICTIONS

A. On-Site Work Hours: Work generally shall be performed from 7 a.m. to 7 p.m., Monday through Friday, except when otherwise indicated. Work outside these hours or days shall be approved by the Owner.

B. Comply with seasonal closure dates for work in road right-if-ways established by ToJ. Obtain right-of-way permitting from ToJ when encroachments are required.

C. Operation of Existing Facilities: The Contractor is not authorized, except under emergency conditions, to operate any Owner operated equipment.

D. Construction Limits: “Limit of Disturbance Lines” are provided on the drawings to describe construction boundaries. Secure site by installing chain link fencing with brown or green slats at the limits of disturbance boundary. Seek approval of fencing location by Engineer/Owner prior to conduction land disturbing activities.

E. Soil: If practical, schedule construction during dry periods and when surface and ground water levels are low to minimize issues with soil compaction in trenches.

F. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

   1. Notify Owner/Engineer not less than one (1) week in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner/Engineer’s written permission.
   3. It should be expected that certain work activities, including changeover from existing to new water facilities, will involve work at night to minimize disruptions.
   4. Hours for Utility Shutdowns: Utility shutdowns shall be during a period of time of lowest use and shall be limited to 4 hours.
   5. Do not conduct planned utility interruptions outside the days of Monday through Wednesday.

G. Permitting: Contractor shall obtain all permits required for construction of facilities described in this Contract. Comply with permitting requirements listed in Section 01 31 00, PART 1.9 “Project Management and Coordination”.

1.10 SPECIAL CONSTRUCTION REQUIREMENTS

A. There are no seasonal restrictions for this project, with exception to work in public right-of-ways; that work is limited to April 15th through October 15th, or as approved by the Town Engineer.

B. Pre-construction Video: Prior to execution of Work, Contractor shall submit a video recording of the work site in accordance with Section 01 32 33 - Photographic and Video Documentation.

C. If conflicts occur between the report and drawings or specifications, the drawings and specifications govern.

1.11 REPORTS

A. A soils geotechnical report is attached subsequent to this specification for use by Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 11 00

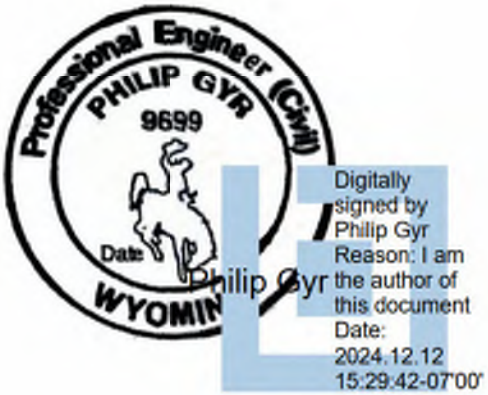
GEOTECHNICAL INVESTIGATION

HIGH SCHOOL ROAD (HSR) WELL HOUSE

HIGH SCHOOL ROAD
TETON COUNTY, WYOMING

PREPARED
FOR
TOWN OF JACKSON
JACKSON, WYOMING

PREPARED
BY
NELSON ENGINEERING
JACKSON, WYOMING



DECEMBER 2024
Project No. 23-302-02

TABLE OF CONTENTS

GENERAL AND PROJECT DESCRIPTION 1

Scope of Services 1

SITE CONDITIONS 1

Description 1
Geologic and Soil Mapping 1
Seismic Hazard 2
Liquefaction 2

SITE INVESTIGATIONS 2

Field Investigations 2

SUBSURFACE CONDITIONS 3

Soil Profiles 3
Groundwater 3

ENGINEERING ANALYSIS AND RECOMMENDATIONS 3

General 3
Seismic Design Parameters 3
Groundwater 3
Concentrated Roots and Stumps 4
Spread Footings 4
Lateral Earth Pressures 5
Interior Slabs-On-Grade 5
Sidewalks and Exterior Slabs 6
Driveway and Parking Lot Recommendations 6

CONSTRUCTION OBSERVATION AND TESTING 6

CONSTRUCTION CONSIDERATIONS 7

Earthwork and Site Grading 7

GENERAL COMMENTS 9

WARRANTY AND LIMITING CONDITIONS 9

GENERAL AND PROJECT DESCRIPTION

A geotechnical investigation was performed for a proposed well house on the south side of High School Road (HSR) in Teton County, Wyoming. The site is located south of the Rangeview Neighborhood and west of Jackson Hole High School, about 3 miles southwest of Jackson, Wyoming. Project plans by Atelier 43 Architects show a one-story structure at grade.

Scope of Services

The scope of services for this investigation was to provide geotechnical recommendations based on a subsurface investigation and soils laboratory testing for the proposed residential project. The purpose of the subsurface investigation was to determine soils and groundwater characteristics. The results of the subsurface investigation and subsequent laboratory testing were utilized in an engineering analysis for recommendations for structural foundations, driveways, and hardscapes. Slope stability analyses were not conducted, as it is our engineering judgment that the existing and proposed slope geometry and composition indicate stability. Specific recommendations for drainage and surface water conveyance were not within the scope of work for this report.

The foundation analysis and resulting recommendations contained herein are based on typical loads for the type of structure envisioned as per the design and plans in progress at the time of this report. In the final design phase of the project, it will be critical that structural loads be properly communicated to the geotechnical engineer to verify that the imposed loading conditions on the proposed foundation configuration do not cause excessive settlement, exceed the bearing capacity of the site soils, or exceed the seismic loading capacity of the foundation elements. Lateral earth pressure recommendations contained within this report are general in nature; it is critical that final retaining wall designs are reviewed by the geotechnical engineer for review and approval. For this report, it is assumed that foundation elements would not be subjected to unusual loading conditions such as eccentric loads or vibratory equipment. Unusual load conditions can induce settlement or reduce the bearing capacity of foundation elements.

SITE CONDITIONS

Description

The project property is an easement in the northeast corner of a 39-acre agricultural lot on the south side of High School Road. Access is provided by High School Road. The property is adjoined by High School Road on the north side, and agricultural parcels on the south, west, and east sides. Topography is flat with native grass vegetation. Multiple irrigation ditches are located to the east and west. Flat Creek is located 3,000 feet to the east.

Geologic and Soil Mapping

The area's surface geology is mapped on the USGS "Geologic Map of the Jackson Quadrangle, Teton County, Wyoming," J.D. Love and H.F. Albee, 2004. Mapped deposits are described as "Qfp – flood-plain deposits – sand, silt, clay, and minor lenses of gravel; lesser amount of gravel at surface distinguishes these deposits from alluvium along topographically lower stream valleys."

The USDA-NRCS Web-based Soil Survey of Teton County has mapped the Tineman gravelly loam, wet, throughout the proposed development. These soils are deep, somewhat poorly

drained, gravelly glaciofluvial deposits on 0 to 3 percent slopes. The composition is gravelly loam, very gravelly sandy loam, and very gravelly sand.

Seismic Hazard

Jackson Hole is located within the Intermountain Seismic Belt, a zone extending from southern Utah through eastern Idaho and western Montana and encompassing western Wyoming and the Teton Range as referenced by Robert B. Smith and Walter J. Arabasz in "Seismicity of the Intermountain Seismic Belt, Neotectonics of North America," 1991. The USGS Earthquake Hazards Program has mapped Quaternary faults and folds in the United States as displayed on Google Earth. Active faults mapped in the vicinity are the Teton Fault, the Phillips Valley Fault, faults south of Blacktail Butte, and secondary faults within the Jackson Hole Valley. In particular, the Teton Fault is thought to be capable of producing major earthquakes of a magnitude of six or greater. The portion of the Teton Fault mapped as active in the Quaternary is approximately 6.5 miles north of the site. Multiple minor earthquakes with epicenters near the site have occurred in recent years (USGS Earthquake Database).

Liquefaction

Saturated sands, silts, and gravels of lower density may be susceptible to liquefaction during earthquakes. Soils observed in the test pits and Well #10 are not likely to liquefy even if saturated during a seismic event. Due to the depth of groundwater and sands the risk of liquefaction, risk of liquefaction induced settlement, or lateral spread slope movement due to liquefaction is very low.

SITE INVESTIGATIONS

Field Investigations

On November 8th, 2024, two test pits, TP-1 and TP-2, were excavated on the perimeter of the building envelope. Test pit locations are shown on **Drawing 2 – Test Pit Location Map** in the Appendix. Test pits were located with a handheld Leica Zeno FLX100 GPS unit. Test pit locations and depths were selected to determine subsurface conditions near and within the proposed development. All test pits were backfilled with excavated material after logging was completed.

Westwood Curtis Construction, Inc. of Jackson, Wyoming, excavated the test pits with a Komatsu PC78MR excavator. Trent McCaffrey, a Professional Engineer at Nelson Engineering, logged the test pits and directed the sampling. Soils were classified in the field and logged by the engineer. The soil classifications, moisture conditions, and presence of organic or other notable features were recorded in the field logs. Bulk samples were sealed in plastic bags and transported to our laboratory for testing and further classification. Groundwater observations were made at the time of the excavation based on field observations of soil moisture conditions. Field observations are presented on the test pit logs in the Appendix.

The stratification lines shown on the test pit logs represent the approximate boundary between soil types. The actual in-situ transition may be either gradual or abrupt. Due to the nature and depositional of natural soils and fills, care should be taken in interpolating subsurface conditions beyond the location of the test pits. Soil conditions can change rapidly in both the lateral and vertical directions. Groundwater conditions shown on the logs are only for the dates indicated. Subsurface conditions were interpreted from the described test

pits at the site. The soil properties inferred from the field assessments supported by our experience formed the basis for developing our conclusions and recommendations.

Samples obtained during the field investigation were visually classified in accordance with ASTM Test Method D-2487-93, which is based on the Unified Soils Classification System. The soil samples stored in our laboratory will be discarded after 30 days from the date this report is submitted unless we receive a specific request to retain them.

SUBSURFACE CONDITIONS

Soil Profiles

Surficial soil in all test pits was 2 to 3 feet of dry, brown/light brown, gravelly silt/silty gravel with grass roots. Below the topsoil to depths of 9 to 10 feet in the pits, were alluvium flood plain deposits composed of dry, brown/light brown, silty gravel with sand. Consistency of the underlying gravels in both TP-1 and TP-2 was very dense. Maximum boulder size was 12" in diameter. Underlying alluvial gravels were composed of approximately 60% gravels, cobbles, and boulders and 40% silty sands in TP-1 and TP-2. Further digging progress was prevented due to massive caving at 9.0 feet depth in TP-2. Abundant tree roots were found at a depth of 7 feet in TP-1 leaving major voids.

Groundwater

Groundwater was not encountered in the test pits during the time of the investigation. Groundwater levels in the area are known to fluctuate by several feet in response to snowmelt runoff as well as seasonal flow in the Snake River, Spring Creek, Crane Creek, Flat Creek, and local irrigation channels. During Well #10 drilling, groundwater was encountered at a depth of 20 feet.

ENGINEERING ANALYSIS AND RECOMMENDATIONS

General

Project plans for a proposed residence are in development by Atelier 43 Architects. Conventional spread footings are assumed for this report. Recommendations herein emphasize concerns at depths at and below the anticipated bottom footing depth in soils influenced by foundation loading. Bearing soils will consist of dense to very dense native gravels with silt and sand.

Seismic Design Parameters

The 2021 International Building Code (IBC) designates site class per ASCE 7-16. Data obtained in this investigation is not sufficient to determine soil parameters as required by ASCE 7-16; therefore, the IBC directs that seismic coefficients and design spectra shall be determined using Site Class D, Latitude of **43.458°**, Longitude of **-110.809°**.

Groundwater

Groundwater levels in the area are known to fluctuate by several feet seasonally in response to snowmelt runoff and irrigation diversions. Seasonal high-water levels are not known with certainty due to lack of data, however groundwater was encountered in Well #10 at 20 foot depth in November 2024, and local well logs show groundwater to be 10 to 20 feet below ground surface. In the absence of site-specific peak runoff monitoring data and analysis, a conservative assumed peak groundwater depth within 8 feet of the ground surface at the test pit locations should be used for design.

Concentrated Roots and Stumps
Tree stumps and areas of concentrated roots shall be removed in their entirety in building footprints. Excavations for root removal shall be backfilled with structural fill or native dense gravels.

Spread Footings
Spread footings bearing on native, dense gravels found in the test pits below surficial topsoil and silty clays are appropriate foundation elements. A net allowable bearing capacity of **4000 PSF** is appropriate. Where surficial clays, silts, and roots are found at bottom of footing elevation, these soils and roots shall be removed until competent dense gravels are revealed. Over-excavation shall extend horizontally beyond the footing edge a minimum of 1.5 feet. Where it is necessary to raise grade beneath footings, structural fill shall be used to create a pad a minimum of 2 feet wider than footings. Fill placed above ground shall have a maximum side slope of 1.5(H): 1(V). Where structural fill must be placed beneath the water table, Clean Rock shall be utilized as fill (see Construction section). During high water season groundwater is likely to be encountered above bottom of footing depth in alluvium. Existing subgrade shall be compacted to a depth of 8 inches to 95% of maximum density per ASTM D698 (Standard Proctor) beneath all footings and fills below footings, or if subgrade is below water, subgrade shall be inspected and approved by this office prior to placing fills.

The net allowable soil pressure includes dead load plus maximum live load. The above analysis assumes **a maximum width of 6 feet** for continuous footings and a maximum dimension of **12 feet for isolated footings**. Construction of large footing sizes can lead to increased settlement as the bearing pressure bulb can extend deeper into the soil profile resulting in settlement of greater than that specified. The net allowable soil pressure includes dead load plus maximum live load. These calculations assume a minimum burial depth of the footing for frost of **34 inches** and a minimum burial depth of heated space footings of 16 inches. The recommendations assume the structure can tolerate a maximum total settlement of **0.5 inches** for a single footing and a differential settlement between footings of **0.25 inches**.

Where it is necessary to raise the grade beneath footings, structural fill shall be used to create a pad a minimum of 2 feet wider than footings. Fill placed above ground shall have a maximum side slope of 1.5(H): 1(V).

Bearing capacity values and settlement shall be checked for each combination of load to determine whether settlement or bearing capacity will control the response of the footing. Construction of large footing sizes can lead to increased settlement as the bearing pressure bulb can extend deeper into the soil profile resulting in settlement of greater than that specified. Foundation elements supporting large, concentrated loads should be analyzed on an individual basis to determine settlement and bearing characteristics. Other foundation parameters are given below:

1. A **one-third** increase in allowable bearing capacity may be used for short duration loads such as wind or seismic.

2. Backfill against shallow foundations and stem walls shall conform to the **Foundation Backfill Typical – Drawing #3** in the Appendix. In no case shall material greater than 6 inches in diameter bear directly on or against foundation

elements. Placing oversized material against rigid surfaces can damage the structure and interferes with proper compaction.

Any soil type encountered at the bottom of footing excavations other than the ones described above should be analyzed by Nelson Engineering. Isolated boulders at footing grade should be over excavated and removed unless approved by Nelson Engineering. Any excessively loose material or soft spots encountered in the footing subgrade will require over-excavation and backfilling with structural fill. All footings shall be suitably reinforced to make them as rigid as possible.

Lateral Earth Pressures

For this analysis, it is assumed that all foundation and retaining walls will be backfilled with structural fill per Drawing #3. Sloped backfill will result in higher lateral loading, if sloped fills of greater than 20% are planned, lateral loading should be analyzed by this office. Adjacent foundations may affect lateral earth loading dependent on proximity. Lateral earth pressures from adjacent structures are not accounted for here.

Lateral loads may be resisted by friction between the footing base and supporting soil and lateral bearing pressure against the sides of the footings. Design parameters recommended are a **coefficient of friction of 0.5** at the footing base and a **lateral passive bearing pressure of 350 psf per foot of depth if compacted fills are carefully placed and tested.**

Design for static at rest loading shall utilize an at-rest equivalent fluid pressure of **60 PCF**. Static active earth pressure design loading shall utilize an equivalent fluid pressure of **40 PCF**.

The total seismic load is the sum of the static and dynamic loads where static is based on active or at-rest conditions. Seismic loading shall be determined using the following equations.

- Basement (restrained) walls with level backfill: $P_{ae} = \frac{1}{2}\gamma H^2(0.68PGA/g)$
- Cantilever (unrestrained) walls with level backfill: $P_{ae} = \frac{1}{2}\gamma H^2(0.42PGA/g)$
- Cantilever (restrained) walls with sloping backfill*: $P_{ae} = \frac{1}{2}\gamma H^2(0.70PGA/g)$

γ=unit weight of backfill. Use 135 PCF for Structural Fill, 125 PCF for Clean Rock

**Applicable for sloped backfill less than 2(H):1(V)*

PGA is defined as $S_{DS}/2.5$. The point of application of the dynamic load is at 1/3H where H is the wall height.

Interior Slabs-On-Grade

All organics, roots, and topsoil shall be stripped and removed from slab footprints. Where roots, fills, silts, and clay soils are encountered below the bottom of slab depth, additional excavation shall be performed to remove these soils and organics until gravels are encountered. Slabs shall be founded upon the following section from top to bottom: 1) a leveling course mat 4 inches in thickness composed of a ¾-inch minus road base aggregate WYDOT GR or equivalent compacted to a minimum of 95% of maximum density as determined by ASTM D 698, 2) Structural fill placed to achieve grade as necessary, and 3) Native cobble and gravel alluvium compacted to a depth of 8 inches to a minimum of 95% density as determined by ASTM D 698. Any excessively loose material or soft spots encountered in slab subgrades will require over-excavation and backfilling with structural fill. Structural fill may be omitted where NE approves dense gravel subgrades as suitable.

Any fill required to increase the elevation of slabs should meet the requirements for structural fill. All fill material within 2 feet of the slabs must be compacted to a minimum of 95% of the maximum density as determined by ASTM D698.

All slabs should be a **minimum of 4 inches thick**. A moisture retardant barrier can be placed beneath all floor slabs to minimize potential ground moisture effects on floor coverings and to minimize the potential for radon infiltration. Concrete slab-on-grade control joints should be saw-cut as early as possible. Nelson Engineering recommends the use of a soft cut system, which allows saw cutting as soon as the concrete can support foot traffic. Successful crack control is dependent upon proper joint spacing. Control joints should be placed in accordance with current Portland Cement Concrete Paving Association guidelines.

Sidewalks and Exterior Slabs

Exterior sidewalks, slabs, and hardscapes shall have adequate drainage and irrigation design measures to ensure clay and silt subgrades are not wetted. All organics, roots, and topsoil shall be stripped and removed from slab footprints. Sidewalks and exterior slabs shall be placed upon the following section: 1) a leveling course mat 4 inches in thickness composed of a ¾-inch aggregate WYDOT GR or equivalent compacted to a minimum of 95% of maximum density as determined by ASTM D 698, 2) native subgrade soils compacted to 8-inch depth to a minimum of 95% density as determined by ASTM D 698. Any excessively loose material or soft spots encountered in slab subgrades will require over-excavation and backfilling with structural fill. Structural fill may be omitted where NE approves dense gravel subgrades as suitable. Any fill required to increase the elevation of slabs should meet the requirements for structural fill. All fill material within 2 feet of the slabs must be compacted to a minimum of 95% of the maximum density as determined by ASTM D698.

Driveway and Parking Lot Recommendations

Topsoil and organics shall be removed in driveway and parking areas. Recommended driveway and parking lot sections are given in the table below. Structural fill thickness may be reduced or omitted where dense gravel forms the subgrade as approved by NE. Proper drainage is essential for satisfactory road and parking area performance.

PAVEMENT SECTION COMPONENTS	Paved	Gravel Surfaced
Asphaltic Concrete	2.0 inches	
¾ inch Minus Crushed Aggregate	4.0 inches	6.0 inches
Structural Fill	12 inches	12 inches
Compacted Subgrade	8 inches of underlying soils compacted to 95% of max. as determined by ASTM D698.	

*Structural fill thickness may be reduced where dense gravel forms the subgrade as approved by NE.

Construction Observation and Testing

The recommendations provided in this report are based on subsurface conditions disclosed by the investigation and our general experience in the project area. Interpolated subsurface conditions should be verified in the field during construction. The following items shall be conducted prior/during construction by a representative of Nelson Engineering to verify compliance with the geotechnical and civil engineering recommendations provided herein,

as applicable. The project structural and geotechnical engineers may upgrade any condition when deemed necessary during the development of the proposed improvement(s).

- Review of final approved grading and structural plans prior to the start of work for compliance with geotechnical recommendations.
- Attendance of a pre-grade/construction meeting prior to the start of work.
- Observation of keyways, subgrade, and excavation bottoms.
- Testing of any fill placed.
- Observation of footing excavations prior to steel placement and removal of excavation equipment.
- Field observation of any "field change" condition involving soils.
- Walk through final drainage detailing prior to final approval.

The project soils engineer may at their discretion deepen footings or locally recommend additional steel reinforcement to upgrade any condition as deemed necessary during site observations. Nelson Engineering shall, prior to the issuance of the certificate of occupancy, issue in writing that the above inspections have been conducted by a representative of their firm, and the design considerations of the project soils report have been met. The field inspection protocol specified herein is considered the minimum necessary for Nelson Engineering to have exercised due diligence in the soils engineering design aspect of this building. Nelson Engineering assumes no liability for structures constructed utilizing this report not meeting this protocol.

Before commencement of grading Nelson Engineering will require an agreement to perform quality control observation and testing. A minimum of 48 hours' notice is required to mobilize onsite for field observation and testing.

CONSTRUCTION CONSIDERATIONS

Earthwork and Site Grading

Excavation work and heavy equipment access will be difficult due to soft rutting soils when wet conditions exist. Placement of gravel surfacing and/or free-draining native material supported by geosynthetics may be required to provide construction access when ground conditions are wet. General recommendations for earthwork suitability, placement, and compaction procedures are provided below:

- Within the building footprints, hardscape, and roadway footprints, all organic material, deleterious undocumented fill, and debris should be stripped and removed. Loose and disturbed native soils should be scarified, moisture-conditioned, and compacted. Finish surfaces shall be sloped away from foundations at a minimum of five percent.

- Moisture shall be prevented from wetting silt and clay subgrades during construction. Measures to prevent moisture infiltration include grading during construction to drain storm water from exposed excavations. If moisture has been allowed to infiltrate and soften subgrade or bearing soils, excavation and backfill operations should cease and not resume until Nelson Engineering approves the moisture and density conditions of the soils.

- Fill materials shall not be placed, spread, or compacted while the ground is frozen or during unfavorable weather conditions. Fill materials should be at the proper moisture content prior to compaction. Fill shall not contain **frozen soil**. Once placed, fills beneath footings shall be protected from moisture infiltration and frost until backfilled.

- Ponding of water and water infiltration due to snowmelt and rainfall into footing, slab, pavement, and hardscape subgrades shall be prevented. Moisture infiltration and subsequent freezing of soils shall be prevented. Frost heave and excessive settlement may result from moisture infiltration.

- **Structural Fill: Approved structural fills are** Gravels (USCS classification GW or GP) Clean Rock, and Crushed Concrete. Clean Rock and Crushed Concrete may be utilized at and below the water table if approved and inspected by NE.

  Gravels shall have the following characteristics: 6-inch maximum particle size with no more than 40% greater than 2" and no more than 5% fines passing the #200 sieve. Structural fill shall be placed in layers of not more than 8 inches in thickness. Where placed on slopes, fill shall be keyed into the slope in near vertical steps of 16-inch maximum height. Each layer of structural fill should be moisture conditioned to within 2% of optimum moisture content and compacted to a minimum density of 95% of the maximum dry density as determined by ASTM Designation D 698. The maximum density of material containing more than 30% oversize (greater than ¾" diameter) cannot be determined by use of the ASTM Designation D 698. In this case, a field maximum density may be determined by a test strip method. The material shall be compacted at or near optimum moisture content and a field density test shall be taken after each pass of the compaction equipment. This sequence shall continue until the maximum field density is achieved. This maximum field density shall be used for subsequent field compaction tests. Enough density tests should be taken to monitor proper compaction. Where a proctor cannot be performed on structural fill, lift compaction shall be verified via proof rolling with loaded rubber-tired equipment observed and approved of by NE.

  Crushed Concrete shall meet the gradation requirements of gravels and shall be free of all debris and rebar. Gradation and rock source and compaction methods shall be submitted to Nelson Engineering for approval prior to use.

  Clean Rock consisting of hard durable crushed or screened rock of 3/4"-4" may be used as Structural Fill with prior notice and approval of gradation and source by this office. Clean Rock may be used beneath the water table with approval from NE.

  Crushed Concrete and Clean Rock fill compaction testing shall consist of proof rolling with loaded rubber-tired equipment observed and approved of NE.

- Safety of construction personnel including safe trenches and excavations are the responsibility of the contractor. Excavations for retaining walls and foundations shall conform to the applicable OSHA trenching and excavation standards. Excavations and utility trenches shall be laid back to safe slopes or properly shored. Excavations and shoring operations shall be conducted in accordance with the most recent versions of the OSHA Construction Standards for Excavations, Part 1926, Subpart P. Excavations for utilities shall be shored if the proper slope cannot be maintained.

- Backfill placed against structures (i.e., pipes and walls) shall be properly placed in a manner that will not damage these structures. In no case shall material greater than 6 inches in diameter bear directly on or against these structures. Placing oversized material against rigid surfaces can damage the structure and interferes with proper compaction.

GENERAL COMMENTS

It is critical that the owner, architect, structural engineer, and entire design team review this report. When project plans and specifications are complete, a consultation with this office should be arranged to ensure compliance with this report. Additional or supplementary recommendations concerning foundations and earthwork may be required at this time. Concrete testing and special inspections should be performed prior to and during placement of all concrete to ensure concrete and reinforcing steel bar comply with project plans and specifications.

WARRANTY AND LIMITING CONDITIONS

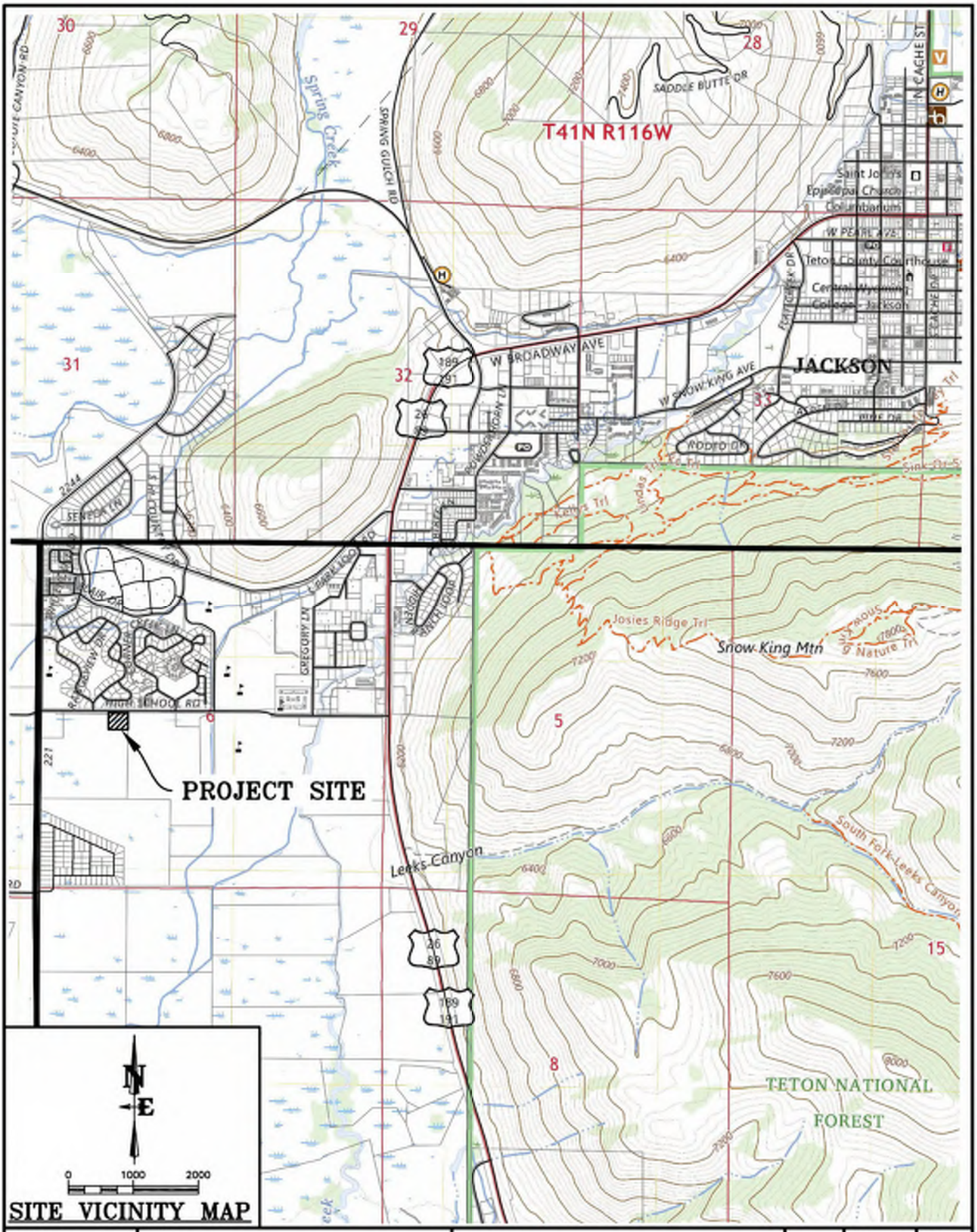
This report was prepared for use by the Town of Jackson ("Client"). The scope of work was specifically prepared for and limited to the specific purpose of providing geotechnical recommendations for project the described. The report is for the sole use of the named client and the design and construction team for this project. This report is non-transferable to future property owners without the written consent of both Nelson Engineering and the client. This report has been prepared based on a limited amount of data. Actual site conditions may vary. These services have been performed in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in this locality at the time the report was prepared. No other warranty is made or implied. This report is site-specific. The report is limited to the information available at the time it was prepared. In the event additional information is provided to Nelson Engineering following this report, it will be forwarded to the client in the form received for evaluation by the client. Use or misuse of this report, or reliance upon the findings hereof by any parties other than the Client, is at their own risk. Neither the Client nor Nelson Engineering may make any representation of warranty to such other parties as to the accuracy or completeness of this report or the suitability of its use by other parties for any purpose whatsoever, known, or unknown, to the Client or Consultant. Neither Client nor Nelson Engineering shall have any liability to or indemnify or hold harmless third parties for any losses incurred by the actual or purported use or misuse of this report.

Prepared By:
Trent McCaffrey, PE
Geotechnical Engineer

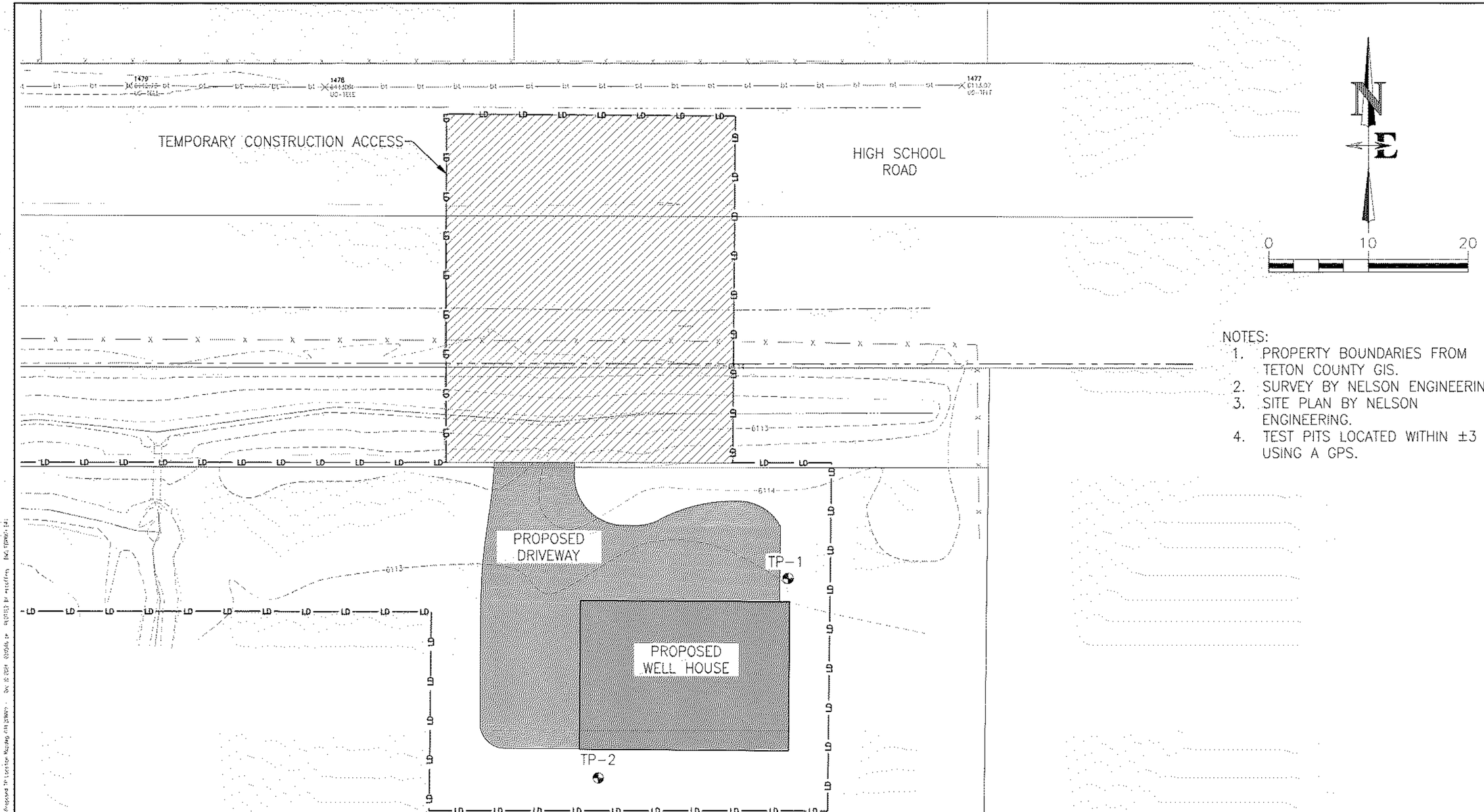
Reviewed By:
Philip Gyr, PE
Principal Geotechnical Engineer

APPENDIX

DRAWINGS



DRAWING NO: 1	TITLE: HIGH SCHOOL ROAD WELL HOUSE	NELSON ENGINEERING	DATE: 12/11/2024	REV.
JOB NO: 23-302-02	GEOTECHNICAL INVESTIGATION	P.O. BOX 1569, JACKSON WYOMING (307) 733-2087	SURVEYED: -	
			DRAWN: TH	
			CHECKED: PG	
			APPROVED: PG	



NOTES:

1. PROPERTY BOUNDARIES FROM TETON COUNTY GIS.
2. SURVEY BY NELSON ENGINEERING.
3. SITE PLAN BY NELSON ENGINEERING.
4. TEST PITS LOCATED WITHIN ±3 FEET USING A GPS.

REV.	DATE	
	12/10/2024	
	SURVEYED	
	ENGINEERED	TM
	DRAWN	TM
	CHECKED	PG
	APPROVED	PG

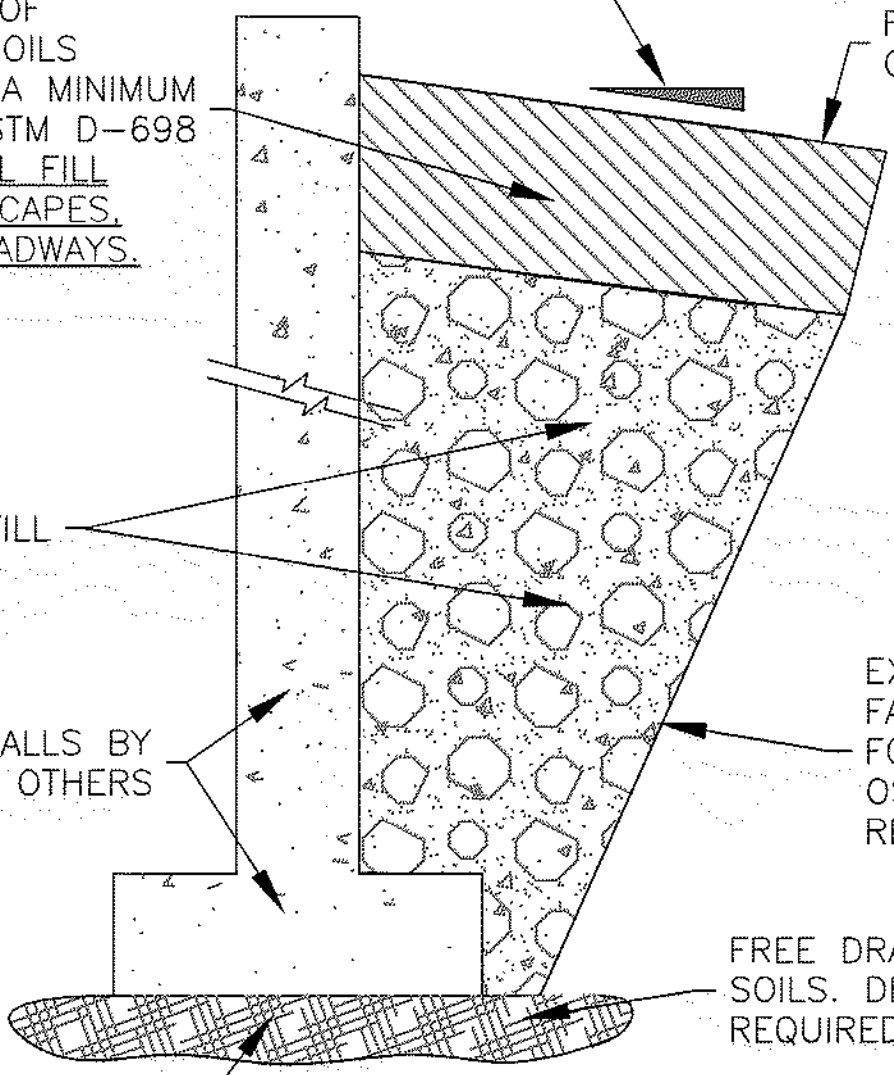
NELSON ENGINEERING
P.O. BOX 1598, JACKSON WYOMING (307) 733-2087

DRAWING TITLE: TEST PIT LOCATION MAP

JOB TITLE: HIGH SCHOOL ROAD WELL HOUSE
GEOTECHNICAL INVESTIGATION

DRAWING NO: 2

JOB NO: 23-302-02

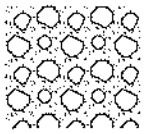


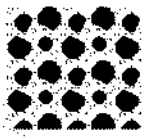
FOUNDATION BACKFILL TYPICAL
NOT TO SCALE

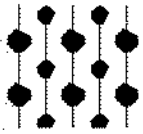
DRAWING NO: 3	TITLE: HIGH SCHOOL ROAD WELL HOUSE	NELSON ENGINEERING	DATE	12/10/2024	REV.
JOB NO: 23-302-02	FOUNDATION BACKFILL TYPICAL	P.O. BOX 1598, JACKSON WYOMING (307) 733-2087	SURVEYED	N/A	
			DRAWN	PG	
			CHECKED	PG	
			APPROVED	PG	

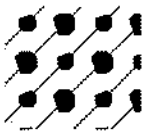
TEST PIT LOGS

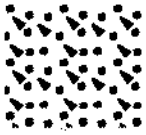
SOIL GRAPHICS

GW 

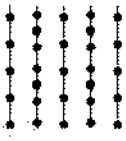
GP 

GM 

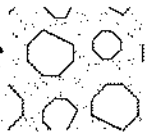
GC 

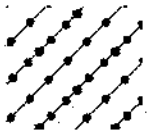
SW 

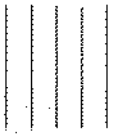
SP

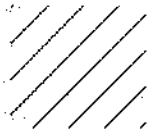
SM 

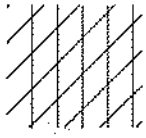
BEDROCK

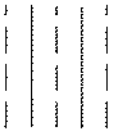
COBBLES/BOULDERS 

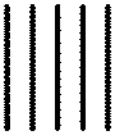
SC 

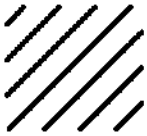
ML 

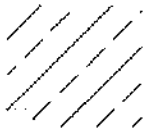
CL 

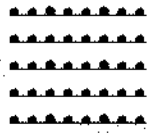
ML–CL 

OL 

MH 

CH 

OH 

PT 

NOTE: ANGLED DEMARCATIONS ON THE LOGS INDICATE APPROXIMATE OR POORLY DEFINED BOUNDARIES BETWEEN SOIL TYPES.

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

GEOTECHNICAL GENERAL NOTES

CORRECTED SPT: Standard Penetration Test values corrected to $N1_{60}$ correcting for theoretical free-fall hammer energy and overburden pressure per 7th edition of the AASHTO Bridge Design Specifications.

DRILLING, SAMPLING, AND SOIL PROPERTIES ABBREVIATIONS AND SYMBOLS

N: Standard Penetration Test
U_c: Unconfined compressive strength, Pounds/ft^2 (PSF)
Pp: Pocket Penetrometer values, Ton/ft^2 (TSF)
FILGC: Fragments indicate gravels and cobbles larger than split spoon diameter.
w: Water content, %
LL: Liquid limit, %
PI: Plasticity index, %
gd: In-situ dry density, lbs/ft^3 (PCF)
: Ground water level
SS: Split-Spoon Sample
ST: Shelby Tube Sampler
CS: Cylindrical Brass Lined Sample

Monitoring Well, diagonal hatching indicates screen and sand packed interval

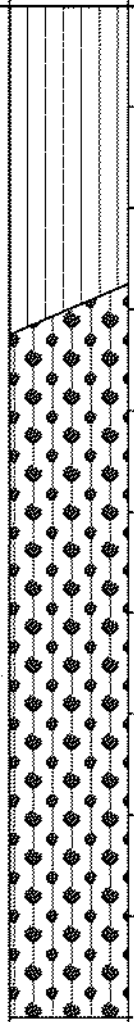
SOIL RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Non-Cohesive Soils	SPT	Cohesive Soils	Pp-(tons/ft^2)
Very Loose	0 - 4	Very Soft	0 - 0.25
Loose	4 - 10	Soft	0.25 - 0.50
Slightly Compact	8 - 15	Medium Stiff	0.50 - 1.00
Medium Dense	10 - 30	Stiff	1.00 - 2.00
Dense	30 - 50	Very Stiff	2.00 - 4.00
Very Dense	50+	Hard	4.00+

PARTICLE SIZE

Boulders:	12 in.+	**Coarse Sand:**	5 mm(#4)-2 mm(#10)	**Silts and Clays:** <#200
Cobbles:	12 in.-3in.	**Medium Sand:**	2 mm(#10)-0.4mm(#40)	
Gravel:	3in.-5mm(#4)	**Fine Sand:**	0.4mm(#40)-0.075mm(#200)	

PROJECT NAME: **HIGH SCHOOL ROAD WELLHOUSE #10**	**TEST PIT No. 1**	PAGE:	1
DATE STARTED / FINISHED: **11/8/2024**	OPERATOR: **WESTWOOD CURTIS CONSTRUCTION, INC.**		
LOGGED BY: **TRENT MCCAFFREY, PE**	EXCAVATOR TYPE: **KOMATSU PC78MR**		
BOREHOLE LOCATION/ELEVATION: **SEE TEST PIT LOCATION MAP**			



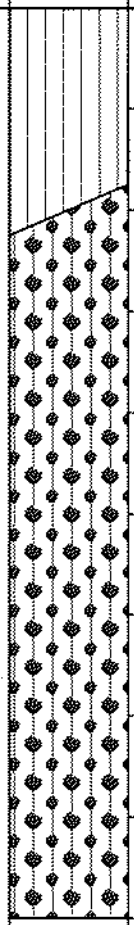
DEPTH (FT)	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	DRY DENSITY (PCF)	MOISTURE (%)	REMARKS
				This log is part of a report prepared by Nelson Engineering for this project and should be read with the report. This summary applies only at the location of the test pit and at the time of excavation. Subsurface conditions may differ at other locations and may change at this location with passage of time. The data presented is a simplification of actual conditions encountered.					
0				*0'–3' DRY, BROWN, GRAVELLY SILT WITH SAND, ~40% GRAVEL, ~60% SILTY SAND MATRIX, MAX. COBBLE DIMENSION OF 6" DIAMETER*					*NORTHEAST CORNER OF PROPOSED WELLHOUSE.*
1									*GROUND SURFACE IS GRAVEL FOR TEMPORARY ROAD TO GIVE CONSTRUCTION ACCESS.*
2									
3				*3.0'–BOP' DRY, BROWN/LT BROWN, SILTY ALLUVIAL GRAVELS WITH SAND, DENSE, ~60% GRAVEL, ~40% SILTY SAND MATRIX, MAX. BOULDER DIMENSION OF 12" DIAMETER*					*ABUNDANT TREE ROOTS TO 7' DEPTH. MAJOR VOIDS DUE TO ROOTS.*
4			*TP1-1 4'–5'*						
5									
6									*HARD DIGGING TOP – BOP*
7									*MODERATE CAVING DUE TO GRAVELS FROM 3'–7' DEPTH.*
8									
9			*TP1-2 9'–10'*						
10				*BOP=10.0'*					*NO GROUNDWATER ENCOUNTERED.*
11									
12									
13									
14									
15									

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

CLIENT: **TOWN OF JACKSON**
JACKSON, WYOMING

JOB NO. 23-302-02

PROJECT NAME: **HIGH SCHOOL ROAD WELLHOUSE #10**	**TEST PIT No. 2**	PAGE:	1
DATE STARTED / FINISHED: **11/8/2024**	OPERATOR: **WESTWOOD CURTIS CONSTRUCTION, INC.**		
LOGGED BY: **TRENT MCCAFFREY, PE**	EXCAVATOR TYPE: **KOMATSU PC78MR**		
BOREHOLE LOCATION/ELEVATION: **SEE TEST PIT LOCATION MAP**			



DEPTH (FT)	SAMPLES: UNDISTURBED	SAMPLES: BULK	SAMPLE ID	MATERIAL DESCRIPTION	LIQUID LIMIT	PLASTIC LIMIT	DRY DENSITY (PCF)	MOISTURE (%)	REMARKS
1				*0'–2' DRY, LT BROWN, SILTY GRAVEL WITH ABUNDANT GRASSROOTS, VERY DENSE, ~80% GRAVEL, ~20% SILTY SAND MATRIX*					*SOUTHWEST CORNER OF PROPOSED WELLHOUSE.*
2				*2.0'–BOP' DRY, BROWN, SILTY ALLUVIAL GRAVELS WITH SAND, VERY DENSE, ~60% GRAVEL, ~40% SILTY SAND MATRIX*					*MINOR CAVING 0'–2'*
3									*MAJOR CAVING 2'–BOP*
4		X	*TP2–1 4'–5'*						*HARD DIGGING TOP – BOP*
5		X							
6									
7									
8		X	*TP2–2 9'–10'*						*NO GROUNDWATER ENCOUNTERED.*
9				*FURTHER PROGRESS PREVENTED DUE TO CAVING BOP=9.0'*					
10									
11									
12									
13									
14									
15									

This log is part of a report prepared by Nelson Engineering for this project and should be read with the report. This summary applies only at the location of the test pit and at the time of excavation. Subsurface conditions may differ at other locations and may change at this location with passage of time. The data presented is a simplification of actual conditions encountered.

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

CLIENT: **TOWN OF JACKSON**
JACKSON, WYOMING

JOB NO. 23-302-02

SECTION 01 27 00 – MEASUREMENT & PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. The intent of this section is to explain, in general, what is and what is not included in a contract line item, the limits or cut-off points where one item ends and another begins, and how it is paid for in accordance with the Bid Schedule.

B. If no contract line item exists for a portion of the work, include the costs in a related item.

1.2 PAYMENT

A. The owner will make progress payments as defined in Article 5 of the Agreement.

B. All pay items listed in this section shall supersede any other measurement and payment sections, if specified, in other supplemental or standard specifications.

C. When the contract stipulates the item be removed and replaced, each item removed, and prior to replacement, will be measured at the bid schedule unit of measurement and paid up to 25 percent of the per unit bid price.

1.3 MEASUREMENT OF QUANTITIES AND BASIS OF PAYMENT

A. Quantities shown on the bid schedule are estimated and are to be considered approximate. Actual constructed quantities may vary. The Contractor will be compensated only for those items and materials actually installed and approved as part of the project. No additional pay will be granted for items or materials not installed.

1. Progress payment determinations shall be subject to verification by the Owner or Owner's Representative, and no payment shall be due for work not satisfactorily completed as determined in accordance with the Contract Documents.
2. Payment will be made for the work completed less retained amounts in accordance with provisions of the Contract Documents.
3. Payment amounts will be based on the Bid Schedule, or Contractor's final scheduled of values (SOV) and mutually agreed upon quantity (percentage) of completion for each item.
4. Stored materials will not be paid for as part of this contract unless specifically approved by the Engineer.
5. It is the Contractor's responsibility to have adequate materials and fittings on site to make all utility tie-ins.
6. The Contractor shall not be reimbursed for any restocking fee or freight to return any un-used materials to suppliers.

B. The cost of all material and labor required to complete this project as specified and shown on the drawings, but not specifically included as a pay item, shall be included in the bid price of its related

bid item. No extra pay shall be granted for items that are reasonably foreseen as necessary for the proper installation of an item.

C. Owner and Engineer shall have the ability to modify individual bid item quantities as needed without a change order, as long as overall project cost is not exceeded by more than 10%.

D. If any work on the project falls under any of the Bid Item Descriptions listed below, then it will be measured and paid as described below. This includes work that is done outside the normal progression of construction activities.

1.4 LIST OF CONTRACT LINE ITEMS

A. Contract Line Item No. 1: Section 01 17 13 - Mobilization

1. This item consists of furnishing all materials, equipment and labor for preparatory work and operation including, but not limited to, those necessary for the movement of personnel, equipment, supplies and incidentals to the project sites; for the establishment of all facilities necessary for the work on the project; for the costs of obtaining the required bonds and insurance; and for all other work and operations which must be performed, or costs incurred prior to beginning work on the various items on the project. The bid price for mobilization shall be capped at 10% (maximum) of the total project cost.

2. Measurement of "Mobilization" shall be in accordance with the specifications at the Lump Sum (LS) price stipulated in the contract. The amount due shall be calculated at each pay application submittal and determined by the percent of the overall original contract price earned, excluding change orders, materials stored on site, and other contract price adjustments.

3. Payment for "Mobilization" shall be made at the Lump Sum (LS) price as indicated in the bid schedule. Payment of the total lump sum price bid will be made incrementally in accordance with the following table and include all labor, materials, and equipment required to complete the task:

Percent of Original Contract Amount Earned (PCE)	Percentage of Lump Sum Price for Mobilization to be paid (PMP)
0 – 15	25%
15.1 – 35	50%
35.1 – 50	75%
50.1 +	100%

B. Contract Line Item No. 2: Section 01 95 00 - Force Account

1. This item consists of furnishing all materials, equipment and labor to perform special work items which are clearly outside the scope of the project requirements that which are authorized by the Owner and Engineer.

2. No quantity measurement will be made for "Force Account Work" other than time-and-materials required to complete each work item and/or lump sum price agreed upon by Contractor, Owner and Engineer. Time will begin when all equipment and personnel are present at the site of the proposed work and will end when all work at the site is complete. No time will be allowed for travel to and from the site.

3. Payment for “Force Account” shall be apportioned based on the contract unit price as indicated in the Bid Schedule.

C. Contract Line Item No. 3: Well 9 Completion

1. This item consists of furnishing all materials, equipment, and labor for “Well 9 Completion”, including, but not limited to, the pump, motor, column pipe, check valve, electrical cable and disconnect, and pressure transducer. Includes testing, commissioning, and operations & maintenance training. All well installations must be complete, fully functional, tested, and accepted as per Drawings and Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the " Well 9 Completion " as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor’s approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the " Well 9 Completion” as listed in the Bid Schedule, or in accordance with the Contractor’s approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

D. Contract Line Item No. 4: Well 10 Completion

1. This item consists of furnishing all materials, equipment, and labor for “Well 10 Completion”, including, but not limited to, the pump, motor, column pipe, check valve, chlorine and phosphate drop pipes, electrical cable and disconnect, and pressure transducer. Includes testing, commissioning, and operations & maintenance training. All well installations must be complete, fully functional, tested, and accepted as per Drawings and Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the " Well 10 Completion" as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor’s approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the " Well 10 Completion” as listed in the Bid Schedule, or in accordance with the Contractor’s approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

E. Contract Line Item No. 5: Pump House Building

1. This item consists of furnishing all labor, materials, equipment, and services necessary for the complete construction of the "Pump House Building." The scope of work includes, but is not limited to: excavation and fill for the building foundation; installation of below-grade piping, including the sanitary waste system and associated equipment; construction of the foundation, backfill, floor slab, walls, roof, insulation, windows, doors, exterior façade,

and all architectural finishes. All work shall be complete and performed as shown on the Drawings and as specified in the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the "Pump House Building" as listed in the Bid Schedule and/or, based on the completion of items identified in the Contractor's approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the "Pump House Building" as listed in the Bid Schedule, or in accordance with the Contractor's approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

F. Contract Line Item No. 6: Building Process Piping

1. This item consists of furnishing all labor, materials, equipment, and services necessary for the complete installation of the "Building Process Piping." The work includes, but is not limited to, the installation of supply and transmission piping comprising the common well supply manifold, including all associated valves, well meters, fittings, and ancillary connections. The scope also includes the complete installation, testing, and acceptance of the fire suppression system, in full compliance with the requirements of the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the " Building Process Piping " as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor's approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the " Building Process Piping" as listed in the Bid Schedule, or in accordance with the Contractor's approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

G. Contract Line Item No. 7: Building HVAC

1. This item consists of furnishing all labor, materials, equipment, and services necessary for the complete installation of the "Building HVAC" system. The scope of work includes, but is not limited to, the installation of heaters, ventilators, louvers, fan coil units, air conditioning units, and all associated components. HVAC systems shall be installed complete, fully tested, and accepted in accordance with the Drawings and the requirements of the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the " Building HVAC " as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor's approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the "Building HVAC" as listed in the Bid Schedule, or in accordance with the Contractor's approved

SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

H. Contract Line Item No. 8: Building & Site Electrical

1. This item consists of furnishing all labor, materials, equipment, and services necessary for the complete installation of the "Building & Site Electrical" systems. The scope of work includes, but is not limited to: coordination and installation of the building electrical service, including vault (if applicable), transformer & concrete pad, conduits, conductor and meter; main and distribution electrical panels; step-down transformers; conduit systems; conductors; and all required connections to the standby generator, wells, process equipment, and HVAC systems. The work also includes installation of all interior and exterior building lighting. All electrical systems shall be installed complete, fully tested, and accepted in accordance with the Drawings, Specifications, and all applicable requirements of the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the " Building & Site Electrical " as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor's approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the " Building & Site Electrical" as listed in the Bid Schedule, or in accordance with the Contractor's approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

I. Contract Line Item No. 9: Standby Generator

1. This item consists of furnishing all materials, equipment and labor for completion of the "Standby Generator". The work includes, but is not limited to, installation of the generator, day tank and fill station, air cooling system, automatic transfer switch, and muffler, complete, tested and accepted. All electrical systems shall be installed complete, fully tested, and accepted. The standby generator system shall be installed complete, fully tested, and accepted in accordance with the Drawings, Specifications, and all applicable requirements of the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the " Standby Generator" as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor's approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the " Standby Generator" as listed in the Bid Schedule, or in accordance with the Contractor's approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

J. Contract Line Item No. 10: Chlorine Disinfection System

1. This item consists of furnishing all materials, equipment and labor for completion of the “Chlorine Disinfection System”. The work includes, but is not limited to, installation of all plumbing; valves; meter; booster pump; injectors; chlorine feed, monitoring and safety equipment. The chlorine disinfection system shall be installed complete, fully tested, and accepted in accordance with the Drawings, Specifications, and all applicable requirements of the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the "Chlorine Disinfection System" as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor’s approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the "Chlorine Disinfection System” as listed in the Bid Schedule, or in accordance with the Contractor’s approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

K. Contract Line Item No. 11: Orthophosphate System

1. This item consists of furnishing all materials, equipment and labor for completion of the “Orthophosphate System”. The work includes, but is not limited to, installation of all plumbing; valves; meter; booster pump; stands, storage tanks, and metering pumps. The phosphate system shall be installed complete, fully tested, and accepted in accordance with the Drawings, Specifications, and all applicable requirements of the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the "Orthophosphate System" as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor’s approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the “Orthophosphate System” as listed in the Bid Schedule, or in accordance with the Contractor’s approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

L. Contract Line Item No. 12: Site Improvements

1. This item consists of furnishing all materials, equipment and labor for completion of “Site Improvements”. The work includes, but is not limited to, construction of fence; concrete aprons, paved access drive and parking areas; grading prep for landscaping and all other related incidentals required by the contract and accepted as required by the contract. Site improvements shall be installed complete and accepted in accordance with the Drawings, Specifications, and all applicable requirements of the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the "Site Improvements" as listed in the Bid

Schedule, and/or based on the completion of items identified in the Contractor's approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the "Site Improvements" as listed in the Bid Schedule, or in accordance with the Contractor's approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

M. Contract Line Item No. 13: Irrigation & Landscaping

1. This item consists of furnishing all materials, equipment and labor for "Irrigation & Landscaping". The work includes, but is not limited to, installation of an irrigation system, final grading of areas disturbed by construction, sod, seeding, fertilizer, plantings and all associated testing, commissioning and training for operation and maintenance of equipment and systems. Irrigation and landscaping shall be installed complete, tested and accepted in accordance with the Drawings, Specifications, and all applicable requirements of the Contract Documents.

2. Measurement for payment shall be based upon the agreed-upon percentage, or unit price, of completion of the subcomponents of the "Irrigation & Landscaping" as listed in the Bid Schedule, and/or based on the completion of items identified in the Contractor's approved Schedule of Values (SOV).

3. Payment shall be made at the contract price bid for each subcomponent of the "Irrigation & Landscaping" as listed in the Bid Schedule, or in accordance with the Contractor's approved SOV. The price and payment for each subcomponent shall constitute full and complete compensation for all labor, materials, equipment, tools, transportation, plant, royalties, warranties, operation and maintenance (O&M) manuals, and all other incidentals and services necessary to complete the work as shown on the Drawings and described in the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 27 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Definitions.
2. Construction Coordination.
3. Submittals.
4. Coordination Drawings.
5. Requests for Information (RFIs).
6. Project Meetings.
7. Environmental Coordination.
8. Permits.
9. Video Record of Worksite.

B. Related Sections:

1. Section 01 32 16 “Construction Schedule” for preparing and submitting Contractor’s construction schedule.
2. Section 01 32 33 “Photographic and Video Documentation” for preconstruction and pre-demolition video requirements.
3. Section 01 73 40 “Execution” for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Section 01 77 00 “Closeout Procedures” for coordinating closeout of the Contract.
5. Section 01 91 14 “Total Building Commissioning” for coordinating the work with Engineer, Owner and Local Building Officials.

1.2 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): An AHJ is an agency that has been granted legal authority over a location, action or resource. This authority includes the ability to issue a permit or other legal permission document.

B. Construction Permits: Are those permits obtained by the contractor based on means and methods used to execute the work. Construction Permits are issued to the Contractor and not to the Owner.

C. Owner Furnished Permits: Are those permits that are obtained by the Owner/Engineer during the design process and provided to the Contractor for compliance with the provisions through construction. These permits may address impacts to natural resources, construction stormwater, dewatering, design of proposed infrastructure etc.

1.3 CONSTRUCTION COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.

1. In accordance with Section 01 32 16 "Construction Schedule," Contactor shall designate an authorized representative to be responsible for the preparation and maintenance of the Construction Schedule. Contractor's representative shall schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
5. Properly plan construction operations to include permit requirements. Allow enough time to execute permit provisions to maintain work schedule, site visits, inspections, and reporting deadlines.

B. Prepare and submit a memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Coordinate activities of subcontractors and ToJ staff to minimize disruption of normal ToJ activities. Inform construction workers and supervisors about the special sensitivity with regards to maintaining water/sewer supply during construction operations, regulations, and appropriate housekeeping.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Permit requirements.
7. Pre-installation conferences.
8. Project closeout activities.
9. Commissioning activities.

E. Comply with Section 01 11 00 – Summary of Work for locating of existing utilities prior to excavation.

F. Examination of Conditions: Before installing Work, verify existing conditions including soils, groundwater and utilities by completing exploratory excavation. Comply with examination requirements specified in Section 01 73 40 – Execution.

G. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner occupancy.

H. Contractor shall be responsible for ensuring that contract specifications are being adhered to. Failure of the Owner/Engineer to immediately reject unsatisfactory workmanship, or to notify the Contractor of their deviation from the specification shall not relieve the Contractor of their responsibility to repair and/or replace unsatisfactory work.

1.4 SUBMITTALS

A. In accordance with paragraph 1.3/A above, submit to the Engineer, a memoranda outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

B. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components, or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

    a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    b. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to the Engineer for resolution of such conflicts.
    c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    e. Indicate required installation sequences.

2. Number of Copies: Submit one digital PDF copy for review. Engineer will return digital copy with notations following review.
3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

C. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing and electrical Work. Show locations of visible ceiling-mounted

devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:

    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.

7. Electrical Work: Show the following:

    a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.

8. Review: Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Engineer determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Engineer will so inform Contractor, who shall make changes as directed and resubmit.

D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
2. File Preparation Format: AutoCad.dwg, Version 2010, operating in Microsoft Windows operating system.
3. Engineer will furnish Contractor one set of digital data files (AutoCad.dwg) of Drawings for use in preparing coordination digital data files.

    a. Engineer makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
    b. Digital Data Software Program: Drawings are available in AutoCad.dwg.

E. Division 01 documents: The following items, applicable to the project, shall be submitted a minimum of one week prior to the Preconstruction Conference. Engineer will notify Contractor of tentative date for the Pre-Construction Conference.

1. Letter designating Project Superintendent.
2. Construction Schedule.
3. A comprehensive breakdown of the Schedule of Values.
4. Accident Prevention Plan.
5. A list of Subcontractors for this project.
6. Written statements from subcontractors certifying compliance with applicable labor standard clauses.
7. Satisfactory evidence of liability insurance coverage and workman's compensation for the Contactor and all subcontractors.
8. Groundwater Dewatering Plan
9. Waste Management Plan
10. Hazardous Spill Plan
11. Dust Control Plan
12. Quality Control Plan
13. Temporary Storm Water Pollution Prevention Plan (SWPPP)
14. List of Required Construction Permits. Include the following information for each permit:
    a. Name of Permit.
    b. The AHJ issuing the permit.
15. Information required from the Owner to complete the permit application.

F. All items listed must be provided to the Engineer before the Pre-Construction Conference is held. If all of these documents have not been received one week prior to the scheduled Pre-Construction Conference date, the conference will be cancelled, Notice to Proceed will not be issued, and the Engineer will consider other contractual remedies. Work shall not commence until written Notice to Proceed has been issued.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI to the project Engineer.

1. Engineer will not respond to RFIs submitted by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in the work.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. RFI number, numbered sequentially.
2. Date.
3. RFI subject.
4. Specification Section number and title and related paragraphs, as appropriate.
5. Drawing number and detail references, as appropriate.
6. Field dimensions and conditions, as appropriate.

7. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
8. Contractor's signature.
9. Requested date for response.
10. Attachments: Include sketches, descriptions, measurements, photos, product data, shop drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Form: By Contractor including the following information:

1. Enter the general information at the top of the form including project name, Engineer's designated project number, date, RFI #, Contractor or representative's name and contact information.
2. Enter the details of the question and attach related documents.

D. Engineer's Action: Engineer will review each RFI, determine action required, and respond. Engineer will determine the critical nature of each RFI and issue a response accordingly.

1. The following are not considered to be RFIs and will receive no action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's/Engineer's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Engineer's action may include a request for additional information, in which case time for response will date from time of receipt of additional information.
3. Engineer's action on RFIs may result in the need for a change to the Contract Time or the Contract Sum. All contract changes will be processed following the terms and conditions of the contract.

1.6 PROJECT MEETINGS

A. Preconstruction Conference: Before start of construction, Engineer will arrange an on-site meeting with Contractor. At a minimum, the meeting agenda will include the following applicable items:

1. Roles & Responsibilities/ Lines of Authority.
2. District rules and regulations.
3. Jobsite Safety.
4. Resolution of comments on required Division 01 documents.
5. Coordination of Subcontractors.

6. Labor law application.
7. Modifications.
8. Payments to Contractor.
9. Payroll reports.
10. Contract time.
11. Liquidated damages.
12. Contractor Performance Evaluation.
13. Display of Hotline posters.
14. Notice to proceed.
15. Correspondence procedures.
16. Acceptance/rejection of work.
17. Progress meetings.
18. Submittal procedures.
19. Data Exchange Interface List
20. Final Accessibility Inspection.
21. Inspection Reports.
22. Environmental requirements.
23. Permit requirements.
24. As-constructed drawings/operation and maintenance (O&M) manuals.
25. Weekend, holiday and night work.
26. Reference materials.
27. Value engineering.

B. Progress Meetings: The Engineer will schedule weekly meetings with the Contractor.

1. Attendees: In addition to Owner Representatives, each Contractor, Subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. The meeting agenda will include the following:

    a. Approval of minutes of previous meetings.
    b. Submittal status.
    c. Review of off-site fabrication and delivery schedules.
    d. Requests for information (RFI) and other issues.
    e. Modifications.
    f. Work in progress and projected.
        1) Status of required inspections (Special Inspections, Accessibility, etc.)
    g. Inspections of work in progress and projected special inspections.
    h. Construction Schedule update.
    i. Status of Project Record Drawings and O&M manuals.
    j. Other business relating to work.
    k. Permit requirements.

C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Review of mockups.
    i. Possible conflicts.
    j. Compatibility requirements.
    k. Time schedules.
    l. Weather limitations.
    m. Manufacturer's written instructions.
    n. Warranty requirements.
    o. Compatibility of materials.
    p. Acceptability of substrates.
    q. Temporary facilities and controls.
    r. Space and access limitations.
    s. Regulations of authorities having jurisdiction.
    t. Testing and inspecting requirements.
    u. Installation procedures.
    v. Coordination with other work.
    w. Required performance results.
    x. Protection of adjacent work.
    y. Protection of construction and personnel.
    z. Accessibility Inspection Reports.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

1.7 ENVIRONMENTAL COORDINATION

A. Contractor’s Environmental Manager: Designate an on-site party responsible for overseeing the Contractor’s conformance to environmental goals for the project.

1. Qualifications: Minimum 5 years Construction experience on projects of similar size and scope; with environmental procedures similar to those of this project; must be familiar with environmental regulations applicable to construction operations.
2. Responsibilities: Responsibilities include the following items applicable to the project.

    a. Compliance with applicable Federal, State, and local environmental regulations, including maintaining required documentation.
    b. Overseeing Waste Management and Disposal.
    c. Implementation of the Storm Water Pollution Prevention Plan(SWPPP).
    d. Implementation of the Hazardous Spill Plan.
    e. Implementation of the Dust Control Plan.
    f. Implementation of the Emissions Reduction Plan.
    g. Present an overview of environmental issues and summarize site specific procedures relating to management plans at the Preconstruction conference.
    h. Training for Contractor personnel in accordance with their position requirements.
    i. Monitoring and documentation of environmental procedures.

B. Perform project quality control in accordance with requirements specified in Related Sections, including:

1. Quality Requirements.
2. Regulatory Requirements (including all permit provisions).
3. Natural Features Protection
4. Temporary Storm Water Pollution Prevention
5. Construction Waste Management.
6. Hazardous Spill Prevention
7. Dust Control
8. Emission Reduction

C. Contractor's Environmental Training Program: If applicable, Contractor shall provide environmental training for workers performing work on the project site. Training shall include the following:

1. Overview of environmental issues related to the building industry.
2. Overview of environmental issues related to the Project.
3. Review of site specific procedures and management plans including those listed below as found applicable to the work:

    a. Construction Waste Management.
    b. Temporary Storm Water Pollution Prevention.
    c. Hazardous Spill Plan
    d. Dust Control Plan
    e. Emissions Reduction Plan

1.8 PERMITS

A. General:
1. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, be responsible for obtaining any necessary licenses and permits, and for

complying with any Federal, State and municipal laws, codes, and regulations applicable to the performance of the Work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence. The Contractor shall also be responsible for all materials delivered and Work performed until completion and acceptance of the Work.

2. For the purpose of this contract the Contractor will not be considered an agent of the Owner. Therefore, the Contractor will comply with the appropriate federal, state and local laws.

B. **Owner Furnished Permits:** During the development of the project's design the permits listed below were negotiated and agreed to by the Owner. The terms and provisions of these permits shall be adhered to for the duration specified in each permit.

1. Permit to Construct: A Permit was acquired from the Wyoming Department of Environmental Quality (WDEQ) for construction of new wastewater and sewer facilities described in Section 01 11 00, PART 1.2 "Summary of Work." The AHJ for this permit is WDEQ.

2. Building Permit: Town of Jackson Building Permit with approval for construction of improvements.

3. Well Permitting: All necessary permitting for Well 9 through the Wyoming State Engineer's Office (WSEO), including the following:
   a. Application For Permit to Appropriate Ground Water (U.W. 5)
   b. Statement of Completion and Description of Well or Spring (U.W. 6)
   c. Proof of Appropriation and Beneficial Use of Ground Water (U.W. 8)

C. **Contractor Provided Permits:** The permits listed below are required for construction work described in the construction drawings and specifications. This list shall not be considered complete. It is the responsibility of the Contractor to obtain all permits required to legally conduct the work. Contractor shall obtain permits prior to the start of work.

1. Electrical Permit: Contractor shall obtain all required local permitting (County, etc.) for electrical work

2. Fire Alarm, Detection and Extinguishing Permits: Contractor shall obtain all required local permitting (County, etc.).

3. Right-of-Way Permitting: If required, Contractor shall obtain all necessary permitting from the local AHJ.

D. **Potential Contractor Provided Permits:** The permits listed below were identified during the design process as likely to be required based on typical means and methods of construction. The list is provided to assist the contractor in determining which permits will be required for the contract's chosen means and methods. The list shall not be considered complete, as it is the responsibility of the contractor to determine means and methods, and obtain the required permits. It is the responsibility of the Contractor to obtain all permits required to legally conduct the work.

1. Construction Trailer, Utilities Hookup: Connection permit shall be obtained from the ToJ (Owner) for temporary hookup of water and sewer. Temporary power hookups shall be coordinated with Lower Valley Energy, the local power utility

2. Permit for Temporary Discharge Involving Construction Activities: Permitting may or may not be required depending on the seasonal depth of groundwater during construction. This permit is required where groundwater is discharged to "surface waters of the State" as defined by the WSEO. Groundwater emanating from dewatering operations for construction may not discharge to Class 1 waters. It is the responsibility of the Contractor to seek approval from adjacent landowners for discharge of groundwater offsite. The AHJ for this permit is the WDEQ.

E. Coordination with AHJ Issuing Permits
   1. Coordination: Contact the AHJs as needed and sufficiently in advance to avoid delaying the work: Coordinate meetings, reporting requirements, inspections, or any other requirements.

F. Administrative Procedures:
   1. Coordinate scheduling and timing of required administrative provisions of project permits with AHJs, Owner, and Engineer to avoid conflicts and to ensure orderly execution of the Work.
   2. Supply all needed information to AHJs issuing permits, pay any fees required and provide all material needed to comply with the permit's conditions and provisions.
   3. Provide Engineer digital PDF copies of submitted applications, forms and permits when sent to and or obtained by AHJs.
   4. Close-out all construction permits following project completion. Send PDF copies of all closure forms or correspondence to Engineer.

1.9 PRE-CONSTRUCTION VIDEO

A. Prior to execution of Work, Contractor shall submit a video recording of the work site in accordance with Section 01 32 33 "Photographic and Video Documentation."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 16 – CONSTRUCTION SCHEDULE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section consists of Construction Schedule requirements including but not limited to the following:

1. Schedule of Values
2. Construction Schedule Requirements.
3. Construction Schedule Updates.
4. Time Impact Analysis.

B. Purpose: The purpose of the Construction Schedule is to ensure adequate planning, coordination, scheduling, and reporting during execution of the work by the Contractor. The Construction Schedule will assist the Contractor and Engineer in monitoring the progress of the work, evaluating proposed changes, and processing the Contractor's monthly progress payment.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by the Engineer.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Float: The measure of leeway in starting and completing an activity.

1. Float: Float is not for the exclusive use or benefit of either the Owner or the Contractor but is jointly owned.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

1.3 SUBMITTALS

A. Electronic Copies: All schedules and reports submitted shall be send in PDF format to the Engineer.

B. Schedule of Values: After contract award and before the Pre-Construction conference submit a schedule of dollar values based on the Contract Price Schedule.

C. Construction Baseline Schedule: After contract award and before the Pre-Construction conference, submit one PDF digital copy of the baseline schedule, large enough to show entire schedule for entire construction period.

D. CPM Reports: Concurrent with CPM schedule, submit digital PDF of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of predecessor and successor tasks for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.

E. Construction Schedule Updates: On or before the 7th day preceding the progress payment request date, submit estimates of the percent completion of each schedule activity and necessary supporting data. Provide digital copies.

F. Construction Schedule Revisions and Time Impact Analysis: For each Construction Schedule revision dated PDF digital copies of a Time Impact Analysis. Each Time Impact Analysis shall include a Fragmentary Network (Fragnet), incorporated into the currently accepted Construction Schedule, demonstrating how the Contractor proposes to incorporate a modification, change, delay, or Contractor request.

1.4 QUALITY ASSURANCE

A. The Contractor shall meet with the Engineer on the day of the preconstruction conference to go over the following:

1. Review software limitations, content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.

3. Discuss constraints, including phasing, work stages, area separations, and interim milestones.
4. Review time required for review of submittals and re-submittals.
5. Review requirements for tests and inspections by independent testing and inspecting agencies.
6. Review time required for completion and startup procedures.
7. Review and finalize list of construction activities to be included in schedule.
8. Review baseline schedule comments, resolve issues and progress on incorporating them
9. Review procedures for updating schedule.
10. Discuss reporting requirements and establish a protocol for naming and transmitting electronic schedules.

B. Contractor's Schedule Representative: Before or at the preconstruction conference, designate an authorized representative to be responsible for the preparation and maintenance of the Construction Schedule. The Scheduler shall have prepared and maintained at least 5 previous schedules of similar size and complexity similar to this Contract, demonstrating proficiency in the use of scheduling software. The authorized representative will be responsible for preparing the Baseline Schedule, all required updates, revisions, Time Impact Analyses, and preparation of reports.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate Contractors.

B. Coordinate Construction Baseline Schedule with the Schedule of Values, list of subcontracts, submittals schedule, progress reports, payment requests, and other required schedules and reports.

1. In developing the Construction Baseline Schedule, ensure that the Subcontractor’s work at all tiers, as well as the prime Contractor’s work, is included and coordinated.
2. Secure time commitments for performing critical elements of the Work from parties involved.
3. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SCHEDULE OF VALUES

A. Breakdown each lump-sum item identified in Section 01 27 00 into component work activities used in the schedule, for which progress payments may be requested. The work activities broken out within the schedule of values shall be integrated into and made a logical part of the construction baseline schedule submitted under this specification. The total costs for the component work activities including cost loading shall equal the contract price for that lump-sum item. The Engineer may request data to verify accuracy of dollar values. Include mobilization, general condition costs, overhead and profit in the total dollar value of unit price

items and in the component work activities for each lump-sum item. Do not include mobilization, general condition costs, overhead or profit as a separate item.

B. Do not break down unit price items. Use only the contract price for unit price items.

C. The total cost of all items shall equal the contract price. The Schedule of Values will form the basis for progress payments.

D. An acceptable Schedule of Values shall be agreed upon by the Contractor and Engineer before the first progress payment is processed.

2.2 CONSTRUCTION SCHEDULE REQUIREMENTS

A. Construction Baseline Schedule: Prepare Construction Baseline Schedule using a computerized, cost and resource-loaded**,** time-scaled CPM network analysis diagram for the Work.

1. Develop and finalize Construction Baseline Schedule so it can be accepted for use no later than **30** calendar days after date established for the Notice of Award.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Owners acceptance of the schedule.

2. Establish procedures for monitoring and updating Construction Baseline Schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

B. Construction Baseline Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the CPM network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated duration, sequence requirements, and relationship of each activity in relation to other activities.
2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. The Construction Baseline Schedule as developed shall show the sequence and interdependence of activities required for complete performance of the work. Ensure all work sequences are logical and the Construction Baseline Schedule shows a coordinated plan of the work.
5. Resource loading of each activity shall include all personnel by labor category and equipment type and capacity proposed to complete the activity in the duration shown.
6. Consider seasonal weather conditions in planning and scheduling all work influenced by high and low ambient temperatures, wind, or precipitation to ensure completion of all work within the contract time.

7. Time Frame: Proposed duration assigned to each activity shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity.

   a. An early finish date may be shown but the late finish date must be the same date as the last day of the contract period. An early completion schedule must contain the following:

      1) Insert an activity titled “Project Float” as a successor to the last activity in the early project completion schedule network.
      2) Add a milestone titled “Contract End Date” as a successor to the activity “Project Float”.
      3) Add duration to the activity “Project Float” as required so the milestone “Contract End Date” equals the last day of the Contract Period.

   b. Contract completion date shall not be changed by submission of a schedule that shows an early completion date.
   c. The Contractor shall limit use of lead or lag duration’s between schedule activities.
   d. Project Calendars: Develop and incorporate the following calendars:

      1) Administrative Calendar: Include a calendar that is based on a 7 day week to be used on any activities that are based on calendar days. Apply this calendar to administrative tasks or any other tasks that are not affected by non-working days (Federal Holidays, weather, etc.).
      2) Project Calendar: Include a calendar that is based on the planned work week for the project. Include Federal Holidays, weekends, and any other non-work days indicated in the contract documents. Apply this calendar to activities which are not anticipated to be affected by weather.
      3) Weather Calendar: Utilize the Project Calendar and show anticipated normal downtime related to weather as non-working time. Weather days shall be based on data for the local area from a reliable source like the National Oceanic and Atmospheric Administration (NOAA), or source acceptable to the Engineer. Apply this calendar to activities that are anticipated to be affected by weather.

   e. Activity Duration: Define activities so no activity is longer than 15 calendar days days, except for non-construction activities including mobilization, shop drawings and submittals, fabrication and delivery of materials and equipment.
   f. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 calendar days, as separate activities in the schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

      1) Well Components: Pump & Motor, VFDs, Electrical, etc.

      2) Generator and Disconnect

      3) Variable Frequency Drives

      4) Chlorine Gas Feed System/Equipment

5) Phosphate Metering Pumps

6) Chemical Booster Pumps

7) Fire Sprinkler System

8) Control Equipment: Flow Meters, pressure transducers, etc.

9) Control PID and Program

10) Building Electrical: Panelboards, transformers, lighting systems, etc.

11) HVAC: Heaters, Fans, Vents, Louvers, Air Conditioning, etc.

12) Doors, Garage Doors and Windows

g. Submittal Review Time: Include review and re-submittal times indicated. Coordinate submittal review times in Construction Baseline Schedule.

h. Startup and Testing Time: Include not less than 15 calendar days for startup, testing and commissioning activities.

8. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1) Uninterruptible services.
   2) Use of premises restrictions.
   3) Seasonal ground water variations.
   4) Use of premises restrictions.
   5) Environmental control.

b. Other Constraints:
   1) Uninterruptible water/sewer supply
   2) Work access restrictions due to conflicting construction activities.
   3) Seasonal high groundwater
   4) Seasonal weather and temperatures.

c. Work Stages: Indicate important stages of construction for each major portion of the Work.

   1) Subcontract awards.
   2) Submittals.
   3) Purchases.
   4) Mockups.
   5) Fabrication.
   6) Sample testing.
   7) Deliveries.
   8) Installation.
   9) Tests and inspections.
   10) Adjusting.
   11) Curing.

9. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice of Award, Notice to Proceed, completion of work phases, Substantial Completion and Final Completion.

C. Joint Review, Revision, and Acceptance:

1. Within seven calendar days of receipt of the Contractor's proposed Construction Baseline Schedule, the Owner, Engineer and Contractor shall meet for joint review, correction, or adjustment of the initial Construction Baseline Schedule. Any areas which, in the opinion of the Engineer or Owner, conflict with timely completion of the project shall be subject to revision by the Contractor.
2. Within seven calendar days after the joint review between the Contractor and Engineer, the Contractor shall revise and resubmit the Construction Baseline Schedule in accordance with agreements reached during the joint review.
3. In the event the Contractor fails to define any element of work, activity, or logic, and the Engineer review does not detect this omission or error, such omission or error, when discovered by the Contractor or Engineer, shall be corrected by the Contractor within seven calendar days and shall not affect the contract period.
4. Upon acceptance of the Construction Baseline Schedule by the Engineer, save the schedule as a baseline and update on a monthly basis. The construction schedule update will be used to evaluate the Contractor's monthly applications for payment based upon information developed at the monthly Construction Schedule update meeting.

D. Recovery Schedule: When periodic schedule update indicates the Work is **14** or more calendar days behind the current accepted schedule, a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule must also be submitted. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

E. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

1. Use Microsoft Project 2016, or more recent and/or approved equal.
2. The Contractor shall provide to the Engineer a licensed copy of the software used to create the Construction Baseline Schedule and a software reference manual. The software and reference manual will be returned to the Contractor at completion of the Contract

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE UPDATES

A. Progress Meeting Updates: Provide a 2 week look-ahead schedule, derived from the currently accepted schedule, before each weekly progress meeting. Utilize the look-ahead schedule to facilitate and take notes on discussions held during the progress meeting.

B. Monthly Schedule Updates:

1. General: Update the Construction Schedule on a monthly basis to reflect actual construction progress and activities throughout the entire contract period and until project substantial completion. The status date of each schedule update shall be the 7th day preceding the progress payment request date.

2. Procedure: The Contractor shall meet with the Engineer each month at a Construction Schedule update meeting to review actual progress made through the status date of the Construction Schedule update, including dates activities were started and/or completed and the percentage of work completed on each activity started and/or completed.

3. Submitted Project Schedule: The information provided on the submitted project schedules shall include:
   a. Activity ID; Activity Name; Original Duration; Remaining Duration; Total Float; Early Start; Early Finish; Late Start; Late Finish; Budget.
   b. Project information shall be in the center footer on the page and shall include the project, town and state location, and Engineer's project number.
   c. Contractor information shall be in the upper left header including the contractor name, office location and the name of the Contractor's Schedule Representative.

4. Reports: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

   a. Identification of activities that have changed.
   b. Changes in early and late start dates.
   c. Changes in early and late finish dates.
   d. Changes in activity durations in workdays.
   e. Activities added or deleted.
   f. Changes in the critical path.
   g. Changes in total float or slack time.
   h. Approved Changes in the Contract Time.
   i. Approved Changes is Contract Budget

5. Narrative: The report shall include a brief description of the actual progress made during the update period; actual and potential delaying activities; any impediments to progress; issues related to inclement weather; progress toward established milestones and project float. The report shall include a brief description of the work anticipated to be performed in the next month. Any minor revisions to the schedule should be identified so they can be evaluated and accepted or rejected.
6. As the Work progresses, indicate Actual Completion percentage for each activity.
7. If the schedule update shows a late finish date after the contract completion date, at a minimum, include the following in the narrative with your submission:

   a. Any known delays.
   b. Actions that will be taken to get back on schedule.
   c. Pending modifications.
   d. Impediments or constraints affecting progress.

8. Progress Payments: The monthly updating of the currently accepted Construction Schedule shall be an integral part of the process upon which progress payments will be made under this contract. If the Contractor fails to provide schedule updates or revisions,

then a portion of the monthly payment may be retained until such corrections have been made.

C. Distribution: Distribute copies of accepted schedule to Engineer, Engineers Representative, Construction Management Representative, Subcontractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

D. Construction Schedule Revisions:

1. Required Revisions: If, as a result of the monthly schedule update, it appears the currently accepted Construction Schedule no longer represents the actual prosecution and progress of the work, the Engineer will request, and the Contractor shall submit, a revision to the Construction Schedule. The Contractor may also request reasonable revisions to the currently accepted Construction Schedule in the event the Contractor's planning for the work is revised. If the Contractor desires to make changes, the Contractor shall notify the Engineer in writing, stating the reason for the proposed revision. Accepted revisions will be incorporated into the currently accepted Construction Schedule for the next monthly schedule update.
2. Procedure: If revision to the currently accepted Construction Schedule is contemplated, the Contractor or Engineer shall so advise the other in writing at least seven calendar days prior to the next monthly schedule update meeting, describing the revision and reasons for the revision. Owner-requested revisions will be presented in writing to the Contractor, who shall respond in writing within seven calendar days.
3. Reports: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

a. Identification of activities that have changed.
b. Changes in early and late start dates.
c. Changes in early and late finish dates.
d. Changes in activity durations in workdays.
e. Changes in the critical path.
f. Changes in total float or slack time.

3.2 TIME IMPACT ANALYSIS FOR CONTRACT MODIFICATIONS CHANGES DELAYS AND CONTRACTOR REQUESTS:

1. Requirements: When contract modifications or changes are initiated, delays are experienced, or the Contractor desires to revise the currently accepted Construction Schedule, the Contractor shall submit to the Engineer a written time impact analysis illustrating the influence of each modification, change, delay, or Contractor request on the contract time.
2. Time Extensions: Activity delays, which result in projecting a late completion date, shall not automatically mean that an extension of the contract time is warranted or due the Contractor. It is possible that a modification, change, or delay will not affect existing critical path activities or cause non-critical activities to become critical. A modification,

change, or delay may result in only absorbing a part of the available total float that may exist within an activity chain of the Schedule, thereby not causing any effect on the contract time. Time extensions will be granted in accordance with the terms of the contract.

3. Extension of the contract time will be granted only to the extent the equitable time adjustments to the activity or activities affected by the modification, change, or delay exceeds the total (positive or zero) float available on a particular activity.
4. Procedure: Each time impact analysis shall be submitted within the time period stated in a request for proposal, or the time period designated under the clauses entitled Changes or Default. In cases where the Contractor does not submit a written request for extension of time and a time impact analysis within the designated time, it is mutually agreed that the particular modification, change, delay, or Contractor request does not require an extension of the contract time. Upon acceptance, the time impact analysis shall be incorporated into the currently accepted Construction Schedule at the next monthly schedule update.
5. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall Construction Schedule.

END OF SECTION 01 32 16

SECTION 01 32 33 – PHOTOGRAPHIC AND VIDEO DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pre-construction Video Documentation
   2. Pre-demolition Video Documentation
   3. Post-construction Video Documentation
   4. Photographs

B. Related Sections:

   1. Section 01 33 23 - Submittal Procedures.
   2. Section 02 41 16 - Structure Demolition: Pre-demolition videos taken before commencing with Work.

1.3 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Submit USB thumb drive, or digitally shared (Dropbox, etc.) copies of video and photos taken before, during and subsequent to construction. Submit digital photographs and videos within seven (7) days of taking them.

1.4 USAGE RIGHTS

A. Submitted copies of videos and photos shall become Property of the Owner. Owner retrains the right to utilize, or reproduce visual content.

1.5 QUALITY ASSURANCE

A. Digital video and image content provided shall use the following file naming convention:

YYYY_MD-DD_LOCATION_DIRECTION_SEQ.EXT

YYYY_MM-DD = Date in Year, Month, Day format

LOCATION = Describe by pipeline station or known facility name (eg. WATER.TRANSMISSION.MAIN. 0+00 - 5+00,
.WELL 9 – PUMP & MOTOR, etc.)

DIRECTION (only if not applicable) = Direction of camera view (N, S, E, W, NE, NW, SE or SW).

SEQ = Sequential number from 001 to 999.

EXT = File extension (e.g. jpg, mov, or wmv).

Example digital file naming for video number 101 taken inside the existing Pump House Site on Sept. 20, 2025.

2025_9-20.EXIST.WELL.HOUSE.SITE.101.wmv

B. USB jump drive shall include a label to include the job name, Contract number, submittal number and date.

C. Videos or photos with poor visual and audio quality will be rejected. Upon rejection, Contractor shall reproduce digital content and re-submit.

1.6 DISPUTES AND POTENTIAL CLAIMS

A. In the event a problem arises or dispute occurs, which, may result in a Notice of Potential Claim according to the Project General Conditions and the problem or dispute can be illustrated by photographs and video recordings, the Contractor shall provide such photographs and video to the Engineer.

PART 2 - PRODUCTS

2.1 DIGITAL MEDIA

A. Photographic Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 1024 by 768 pixels (24 bits of color per pixel).

1. Maximum file size: 4MB

B. Video: Provide video in .WMV or .MOV format, produced by a digital video recorder with a 1920 x 1080 resolution.

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION VIDEO

A. Recorded video information will be utilized to ascertain pre-existing conditions prior to contract execution. Video record project site with high resolution equipment.

B. Prior to execution of Work, the Contractor shall:

1. Walk the project site and proposed pipeline alignments in the presence of the Engineer, or representative thereof, and video record all areas that will be subject to construction disturbance.
2. Video record locations of planned pipeline and utility alignments.
3. Video record all internal and external areas subject to potential damage or disturbance, including any additional areas approved for occupation by Contractor prior to commencing with Work.

C. Video recordings shall include a complete, clearly spoken narration of the events being photographed. Also, video recordings shall include an unobtrusive time and date indicator on the film, accurately depicting the time and date when the photography was performed.

D. The Contractor shall mail copies of the videotape to the Engineer two weeks prior to proceeding with the work. Comply with Section 01 33 23 “Submittal Procedures”.

E. Individual digital video files shall use the file naming convention indicated in 1.5A.

3.2 PRE-DEMOLITION VIDEO

A. Prior to demolition, the Contractor shall:
1. Video existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Video structures including the existing pathways, landscaping, parking, etc.

B. Perform video recording 3 days prior to demolition and submit USB copies 48 hours prior to demolition work.

C. Video recordings shall include a complete, clearly spoken narration of the events being photographed. Also, video recordings shall include an unobtrusive time and date indicator on the film, accurately depicting the time and date when the photography was performed.

D. Individual digital video files shall use the file naming convention indicated in 1.5A.

3.3 POST-CONSTRUCTION VIDEO

A. Recorded video information will be utilized to ascertain post construction conditions following contract execution. Video record project site with high resolution equipment.

B. Subsequent to execution of Work, the Contractor shall:

1. Walk the project site and utility alignments in the presence of the Engineer, or representative thereof, and video record all areas affected by new construction.
2. Video improved interior spaces and or temporarily occupied by Contractor for construction.

C. Video recordings shall include a complete, clearly spoken narration of the events being photographed. Also, video recordings shall include an unobtrusive time and date indicator on the film, accurately depicting the time and date when the photography was performed.

D. The Contractor shall submit copies of the videotape to the Engineer in accordance with Section 01 33 23 “Submittal Procedures”, and 01 77 00 “Closeout Procedures.

E. Individual digital video files shall use the file naming convention indicated in 1.5A.

3.4 PHOTOGRAPHS

A. Contractor shall take photos when it is not feasible to obtain video, or if is felt a picture would provide more clarity than a video.

B. Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

C. Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

D. Digital photos shall include an unobtrusive time and date indicator on the image, accurately depicting the time and date when the photography was performed.

E. Individual digital photo files shall use the file naming convention indicated in 1.5A.

END OF SECTION 01 32 33

SECTION 01 33 23 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written, graphic information, and physical samples that require Owner's responsive action.

B. Informational Submittals: Written information that does not require Owner's responsive action. Submittals may be rejected for not complying with the requirements.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 GENERAL SUBMITTAL PROCEDURES

A. General: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual specific sections.

1. Engineer reserves the right to require submittals in addition to those called for in individual sections.
2. Comply with "Special" and/or 'Supplemental Conditions" within the Project contract documents; requirements may include product certification for compliance with American Iron & Steel (AIS), Buy America, sustainability, environmental, or other product requirements.
3. Provide the Specification Section number for each product on each submittal.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Review them for legibility, accuracy, completeness, and compliance with Contract Documents.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittal List: A submittal list has been attached to the end of this Specification Section. The intent is to provide an overall summary of submittal requirements and not a comprehensive list. The requirements of the individual Specification Sections, terms and conditions of the Contract still apply regardless of what is shown on the submittal list.

D. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence when an e-mail with the submittal from the Contractor is received by the Engineer (or designee). When the Engineer has completed their review, an e-mail with a review letter and the submittal attached will be sent back to Contractor. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.

1. Action Submittals

a. Initial Review: Allow 30 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
b. Re-submittal Review: Allow 30 days for review of each re-submittal.

2. Informational submittals

a. Review: Allow 10 working days for review of each submittal.

E. Approved Equals:

1. For each item proposed as an “approved equal,” submit supporting data, including:

a. Drawings and samples as appropriate.
b. Comparison of the characteristics of the proposed item with that specified.
c. Changes required in other elements of the work because of the substitution.
d. Name, address, and telephone number of vendor.
e. Manufacturer’s literature regarding installation, operation, and maintenance, including schematics for electrical and hydraulic systems, lubrication requirements, and parts lists. Describe availability of maintenance service, and state source of replacement materials.

2. A request for approval constitutes a representation that Contractor:

a. Has investigated the proposed item and determined that it is equal or superior in all respects to that specified.
b. Will provide the same warranties for the proposed item as for the item specified.
c. Has determined that the proposed item is compatible with interfacing items.
d. Will coordinate the installation of an approved item and make all changes required in other elements of the work because of the substitution.
e. Waives all claims for additional expenses that may be incurred as a result of the substitution.

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Provide submittals with Engineer approved cover form indicating the following:
    a. General information including project name, Engineer's project number, Contractor's business name, person submittal was prepared by, and date of submittal.
    b. Include a description of the items being submitted on with referenced specification section number.
    c. Identification: Submittal number or other unique identifier, including revision identifier. The submittal number shall correlate with items in the submittal list. If an item is not included, the next available submittal number in the submittal list shall be used.
        i. Submittal number shall use a sequential number (e.g., .001). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., .001.A).
2. Physical samples: Deliver to Engineer, or representative thereof.

G. Re-submittals: Make re-submittals using the same process used with the initial submittal.

1. Note date and content of previous submittal.
2. Note clearly note date, content and extent of revision in the Contractor's submittal form.
3. Re-submit submittals until they are marked "Approved" or "Approved with notations".

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, and others as necessary for performance of construction activities.

I. Use for Construction: Use only final submittals with mark indicating "Approved" or "Approved with notations". Ensure all notations have been incorporated and, at a minimum, keep one copy of the final approved submittal on site for use during construction.

1.4 CONTRACTOR'S USE OF CAD FILES

A. General: At Contractor's written request, copies of CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. Files will be provided as is; no format or other changes to files or changes to the objects in the drawing will be done by the Owner. Translation of this format to another format, and any correction or errors in the files as a result of that translation, shall be the responsibility of the Contractor. CAD files are for use on this project only and may not be used on any other project.

2. Information shown on hard copies, or final digital PDF drawings distributed to the Contractor for construction shall take precedence over information provided in electronic CAD files.

3. By using the electronic files in lieu of preparing an independent set of shop drawings, the Contractor solely accepts the risks of this method of production. Use of these drawing files obligates the Contractor and their subcontractors to review all information shown on the drawing files, make field measurements, and to correct, add to or modify the files as

required to produce accurate drawings. Any job expense, either real or implied, arising due to the use of the drawing files, is the sole obligation of the Contractor. The Contractor will bear full responsibility for any drawings or work products produced, regardless of the method of production used, just as if it had produced the drawings independently.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Manufacturer's warranty.
    d. Manufacturer's installation instructions: When Contract Documents require compliance with manufacturer's printed instructions, provide one complete set of instructions to Engineer and keep another complete set of instructions at the project site until substantial completion.
    e. Manufacturer's catalog cuts: Submit only pertinent pages; mark each page of standard printed data to identify specific products proposed for use.
    f. Wiring diagrams showing factory-installed wiring.
    g. Printed performance curves.
    h. Operational range diagrams.
    i. Compliance with specified referenced standards.
    j. Testing by recognized testing agency.

4. Submit product data in PDF file format before or concurrent with samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.

g. Templates and patterns.
h. Schedules.
i. Notation of coordination requirements.
j. Notation of dimensions established by field measurement.
k. Relationship to adjoining construction clearly indicated.
l. Seal and signature of professional engineer if specified.
m. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Submit shop drawings as a PDF electronic file.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Complete and deliver to Engineer with documentation of action on submitted samples.
3. Identification: Attach label on unexposed side of Samples that includes the following:

a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Submittal Number and title of appropriate Specification Section.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

a. Number of Samples: Submit four sets of Samples. Engineer will retain three Sample sets; remainder will be returned.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by individual Specification Sections.

1. Email, provided by other approved means, informational submittals as PDF electronic files directly to the Engineer.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. Informational submittals that do not comply with the requirements specified in the Contract Documents will be rejected and one copy will be returned.

B. Coordination Drawings: Comply with the requirements specified in Section 01 31 00 "Project Management and Coordination."

C. Contractors Construction Schedule: Comply with the requirements specified in Section 01 32 16 "Construction Schedule."

D. Accident Prevention Plan: Comply with the requirements specified in Section 01 35 23 "Safety Requirements."

E. Schedule of Values: Comply with the requirements specified in Section 01 32 16 "Construction Schedule."

F. Quality Control Plan: Comply with the requirements specified in Section 01 40 00 "Quality Requirements."

G. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

H. Welding Certificates: Prepare written certification that welding procedures and personnel comply with the requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

I. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with the requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

J. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with the requirements in the Contract Documents. Include evidence of manufacturing experience where required.

K. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with the requirements in the Contract Documents.

L. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with the requirements in the Contract Documents.

M. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with the requirements in the Contract Documents.

N. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with the requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

O. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

P. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

Q. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

R. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with the requirements in the Contract Documents.

S. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with the requirements specified in Section 01 78 23 "Operation and Maintenance Data."

T. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

U. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

V. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Statement on condition of substrates and their acceptability for installation of product.

2. Summary of installation procedures being followed, whether they comply with the requirements and, if not, what corrective action was taken.
3. Results of operational and other tests and a statement of whether observed performance complies with the requirements.

W. Traffic Control Plan: Comply with the requirements specified in Section 01 55 26 "Traffic Control."

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions.

3.2 ENGINEER'S ACTION

A. General: Submittals will be disapproved without technical review if identification information is missing, not filled in, or if placed on the back of the submittal; an incorrect format of submittals is provided; the transmittal form is incorrectly filled out; submittals are not coordinated; or submittals do not show evidence of Contractor's approval.

1. Any work done or orders for materials or services placed before approval shall be at the Contractor's own risk.

B. Action Submittals: Engineer will review each submittal, generate comments on corrections or modifications required, and indicate the appropriate action. The submittal will be marked in one of four ways as defined below:

1. NOT EXCEPTIONS TAKEN: Acceptable with no corrections.
2. MAKE CORRECTIONS NOTED: Minor corrections or clarifications required. All comments are clear and no further review is required. The Contractor shall address all review comments prior to proceeding with the work.
3. AMMEND & RESUBMIT: Corrections or clarifications required prior to approval. Contractor shall address comments and resubmit.
4. REJECTED, SEE REMARKS: Rejected as not in accordance with the contract or as requiring major corrections or clarifications. The Engineer will identify the reasons for disapproval. The Contractor shall revise and resubmit with changes clearly identified.

C. Informational Submittals: Engineer will review each submittal and will either accept or reject it.

D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.

END OF SECTION 01 33 23

LIST OF SUBMITTALS

Note:(Complete this portion and attach to Spec. 01 33 23)

ToJ HSR PUMP HOUSE

SUBMITTAL		REQUIREMENTS (indicate with an "X")							
		INFORMATIONAL				ACTION			
Spec. Sec.	Description	CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS	Permits	SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	FIELD REPORTS
Division 1 - General Requirements									
01 31 00	Coordination Drawings		X			X			
01 31 00	Dewatering Discharge Permit				X				
01 32 16	Contractors Construction Schedule		X						
01 32 16	Schedule of Values		X						
01 32 33	Record Videos of the Worksite (USB Thumb Drive)								X
01 33 23	Welding Certificates		X						X
01 33 23	Installer Certificates		X					X	X
01 33 23	Manufacturer Certificates		X					X	X
01 33 23	Product Certificates		X					X	X
01 33 23	Material Certificates		X					X	X
01 33 23	Material Test Reports								X
01 33 23	Product Test Reports							X	X
01 33 23	Research/Evaluation Reports								X
01 33 23	Preconstruction Reports	X							X
01 33 23	Compatibility Test Reports	X							X
01 33 23	Field Test Reports	X							X
01 33 23	Maintenance Data							X	
01 33 23	Design Data			X					
01 33 23	Manufacture's Instructions			X				X	
01 33 23	Manufacture's Field Reports								X
01 35 23	Accident Prevention Plan		X						
01 40 00	Quality Control Plan		X			X			
01 40 00	Quality Control Daily Reports								X
01 50 00	Spill Prevention Plan		X			X			
01 55 26	Traffic Control Plan		X			X			
01 73 40	Surveyors Certificate of Placement	X							X
01 77 00	Project Record Drawings								X
01 78 23	Operation and Maintenance Manuals		X			X		X	

LIST OF SUBMITTALS

Note:(Complete this portion and attach to Spec. 01 33 23)

ToJ HSR PUMP HOUSE

SUBMITTAL		REQUIREMENTS (indicate with an "X")							
		INFORMATIONAL				ACTION			
Spec. Sec.	Description	CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS	Permits	SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	FIELD REPORTS
01 79 00	Demonstration and Training, Instructional Program								
01 79 00	Demonstration and Training Video								X
01 91 14	Contractors Commissioning Plan		X					X	
01 91 14	Closeout Documentation	X	X	X		X	X	X	X
Division 2 - Existing Conditions									
02 41 16	Proposed method, schedule, and sequence of work for demolition and restoration		X						
Division 3 - Concrete									
03 30 00	Concrete reinforcing					X			
03 30 00	Concrete admixtures, curing compounds							X	
03 30 00	Concrete mix design	X						X	
03 30 00	Concrete test results	X							
03 30 00	Concrete curing procedures							X	
03 30 00	Construction Joints					X		X	
03 60 00	Grout Mix design	X						X	
Division 4 - Masonry									
Division 5 - Metals									
05 50 00	Metal Fabrications & Hardware					X			
05 50 10	Ancor Bolts & Expansion Anchors								
Division 6 - Wood, Plastics & Composites									
06 10 00	Wood Bocking & Nailers							X	
06 16 00	Sheathing & Accessories							X	
Division 7 - Thermal & Moisture Protection									
07 11 13	Bituminous Dampproofing							X	

LIST OF SUBMITTALS

Note:(Complete this portion and attach to Spec. 01 33 23)

ToJ HSR PUMP HOUSE

SUBMITTAL		REQUIREMENTS (indicate with an "X")							
		INFORMATIONAL				ACTION			
Spec. Sec.	Description	CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS	Permits	SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	FIELD REPORTS
07 13 26	Self-Adhering Sheet Waterpoofing						X	X	
07 13 53	Elastomeric Sheet Waterpoofing						X	X	
07 21 00	Thermal Insulation							X	
07 25 00	Weather Barriers (Building Paper, Flashing, Drainage)							X	
07 26 00	Vapor Retarders							X	
07 41 13.16	Stand-Seam Metal Roofing					X	X	X	
07 62 00	Flashing and sheet metal					X			
07 92 00	Joint sealants							X	
Division 8 - Openings									
08 11 13	Metal Doors and Frames					X			
08 31 00	Floor Access Doors					X		X	
08 33 23	Overhead Coiling Doors					X		X	
08 51 13	Aluminum Windows					X		X	
08 71 00	Door Hardware							X	
08 80 00	Glazing							X	
Division 9 - Finishes									
09 29 00	Gypsum Board							X	
09 91 13	Exterior Paint						X	X	
09 91 23	Interior Paint						X	X	
09 96 00	High-Performance Paint					X			
Division 22 - Plumbing									
22 10 00	Plumbing Firestopping for Wall/Floor Penetrations							X	
22 05 17	Plumbing Sleeves and Seals							X	
22 05 23	Valves for Plumbing							X	
22 05 29	Hangers & Supports							X	
22 05 48	Vibration & Seismic Controls							X	

LIST OF SUBMITTALS

Note:(Complete this portion and attach to Spec. 01 33 23)

ToJ HSR PUMP HOUSE

SUBMITTAL		REQUIREMENTS (indicate with an "X")							
		INFORMATIONAL				ACTION			
Spec. Sec.	Description	CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS	Permits	SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	FIELD REPORTS
22 05 53	Identification Labeling for Plumbing					X		X	
22 07 19	Pipe Insulation							X	
22 11 16	Domestic Water Piping							X	
22 11 19	Water Piping Specialties (hose bibs, drains, meters, backflow, etc.)							X	
22 13 16	Sanitary Waste Piping							X	
22 13 16	Sanitary Waste Piping Specialties (floor drains, traps, cleanouts, etc.)							X	
Division 23 - Heating, Ventilating, and Air Conditioning (HVAC)									
23 05 29	Hangers & Supports							X	
23 05 48	Vibration and Seismic Controls							X	
23 05 53	HVAC Labels							X	
23 05 93	HVAC Test Reports	X							X
23 07 13	Duct Insulation							X	
23 08 00	Fan Coil Units							X	
23 09 00	HVAC Instrumentation & Controls							X	
23 23 00	Refrigerent Materials & Equipment							X	
23 31 13	Metal Ducts							X	
23 31 16	Non-Metal Ducts							X	
23 33 00	Air Duct Accessories							X	
23 34 23	Power Ventilators (louvers, exhaust fans & accessories)							X	
23 81 26	Split Systm Air Conditioners							X	
23 82 39	Heaters							X	
Division 25 - Integrate Automation									
25 30 00	Instrumentation Equipment							X	
25 51 00	PID Control Narrative Revisions							X	
25 51 00	Productand Software Data							X	

LIST OF SUBMITTALS

Note:(Complete this portion and attach to Spec. 01 33 23)

ToJ HSR PUMP HOUSE

SUBMITTAL		REQUIREMENTS (indicate with an "X")							
		INFORMATIONAL				ACTION			
Spec. Sec.	Description	CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS	Permits	SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	FIELD REPORTS
Division 26 - Electrical									
26 05 19	Low-Voltage Conductors							X	
26 05 23	Control Voltage Power Cables							X	
26 05 26	Grounding (distribution, lightning & foundation)							X	
26 05 29	Elec. Hangers & Supports							X	
20 05 33	Raceways & Boxes							X	
26 05 43	Buried - Ducts & Raceways							X	
26 05 44	Sleeves & Seals							X	
26 05 48	Vibration & Isolation Controls							X	
26 09 23	Building Lighting Controls							X	
26 22 00	Low-Voltage Transformers							X	
26 23 00	Low-Voltage Switchgear							X	
26 24 16	Panelboards							X	
26 27 26	Wiring Devices							X	
26 28 16	Switches and Circuit Breakers							X	
26 29 23	Variable Frequency Drives (well pump)							X	
26 32 13	Genset							X	
26 41 13	Building Lightining Protection							X	
26 51 00	Building Lighting							X	
Division 31 - Earthwork									
31 05 13	Topsoil	X					X	X	
31 05 16	Structural Fill	X						X	
31 05 16	Type 1 pipe bedding							X	
31 05 16	Type 2 pipe bedding							X	
31 05 16	Imported aggregate base course	X						X	
31 23 17	Underground warning tape							X	
31 23 19	Dewatering Plan (if any)		X			X			X
31 23 24	Flowable fill							X	

LIST OF SUBMITTALS

Note:(Complete this portion and attach to Spec. 01 33 23)

ToJ HSR PUMP HOUSE

SUBMITTAL		REQUIREMENTS (indicate with an "X")							
		INFORMATIONAL				ACTION			
Spec. Sec.	Description	CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS	Permits	SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	FIELD REPORTS
Division 32 - Exterior Improvements									
32 12 16	Asphalt Paving Mix Design	X						X	
32 80 00	Irrigation Materials & Equipment							X	
32 91 19.13	Topsoil Amendments							X	
32 92 19.16	Hydraulic Seeding (mixture - see, fert. & mulch)							X	
32 92 23	Sod/Turf	X						X	
32 93 00	Plantings	X						X	
Division 33 - Utilities									
33 11 13	Water Distribution Piping & Fittings							X	
33 12 13	Water Service (<2") Connections							X	
33 12 16	Water Distrution Valves								
33 13 00	Disinfection method, product data		X					X	
33 21 13	Well 9 Equipment: Pump, Motor, Pitless, etc.							X	
33 31 00	Sanitary Sewer Piping (floor drain system)							X	
								X	
Division 40 - Process Integration									
40 05 13.53	Ductile Iron Pipe							X	
40 05 13.73	Plastic Pipe							X	
40 05 23	Process valve actuators							X	
40 05 23.12	Ball Valves							X	
40 05 23.15	Gate Valves							X	
04 05 23.24	Check Valves							X	
40 05 23.72	Miscellaneous Valve, product data							X	
40 05 29	Pipe Hangers and Supports					X		X	
40 05 48	Vibration and Seismic, product data					X		X	
40 23 19	Process Plant Piping & Equipment					X			
40 94 33	PLC's (by others - CST)		X			X		X	

LIST OF SUBMITTALS

Note:(Complete this portion and attach to Spec. 01 33 23)

ToJ HSR PUMP HOUSE

SUBMITTAL		REQUIREMENTS (indicate with an "X")							
		INFORMATIONAL				ACTION			
Spec. Sec.	Description	CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS	Permits	SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	FIELD REPORTS
41 94 33	Process Control Panels and Hardware (by others - CST)		X			X		X	
								X	
Division 46 - Water & Wastewater Equipment									
46 05 53	Equipment Identification Nameplates, Tags, etc.					X		X	
46 31 11	Chlorine Gas Feed Equipment					X		X	
46 33 44	Peristaltic Metering Pumps (phospate pumps)					X		X	

Total

Note:(See color coded instructions on page 2 - Instructions)

SECTION 01 35 23 - SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes establishing an effective accident prevention program and providing a safe environment for all personnel and visitors.

1.3 QUALITY ASSURANCE

A. Comply with contract clauses entitled "Accident Prevention" and "Permits and Responsibilities". In case of conflicts between Federal, State, and local safety and health requirements, the most stringent shall apply. Equipment or tools not meeting OSHA requirements will not be allowed on the project sites. Failure to comply with the requirements of this section and related sections may result in suspension of work.

B. Site Safety Supervisor

1. Before start of work, designate an authorized representative to be responsible for the preparation and maintenance of the Accident Prevention Plan (APP). The Site Safety Supervisor will be responsible for the implementation and enforcement of the accepted APP, daily safety inspections, conducting and documenting weekly and monthly safety meetings, review of safety requirements at progress meetings and preparatory and initial phase inspection meetings, maintain Safety Data Sheets (SDS) and applicable safety reference materials, tracking and resolving safety violations, site personnel and visitor compliance with safety and health requirements, and safety investigation and reporting of accidents/injuries.

C. Qualifications of Employees:

1. All employees must be physically qualified and able to perform their assigned duties in a safe manner.
2. Do not allow employees to perform work whose ability or alertness is impaired because of prescription or illegal drug use, fatigue, illness, intoxication, or other conditions that may expose themselves or others to injury.
3. Operators of vehicles, hoisting equipment, and large mechanical equipment shall be able to understand signs, signals, and operating instructions, and be fully capable of operating such equipment. Provide operating instructions for all equipment. Newly hired operators shall be individually tested by an experienced operator or supervisor to determine if they are capable of safely operating equipment.

1.4 ACCIDENT REPORTING

A. Reportable Accidents: A project reportable accident is defined as death, occupational disease, traumatic injury to employees or the public, fires, and property damage by accident in excess of $250. Notify Engineer immediately in the event of a reportable accident. Within 7 days of a reportable accident, fill out and forward to Engineer an Accident/Property Damage Report.

PART 2 - PRODUCTS

2.1 ACCIDENT PREVENTION PLAN

A. The Plan shall be written to comply with OSHA and project requirements (a generic plan is not acceptable) including but not limited to the following:

1. Name of responsible supervisor to carry out the program.
2. Weekly and monthly safety meetings.
3. First aid procedures.
4. Outline of each phase of the work, the hazards associated with each major phase, and the methods proposed to provide for property protection and safety of the public, Owners staff, Engineers and Staff, and Contractor's employees. Identify the work included under each phase.
5. Training, both initial and continuing.
6. Planning for possible emergency situations, such as floods, fires, cave-ins, slides, explosions, power outages, and wind storms. Such planning shall take into consideration the nature of construction, site conditions, and degree of exposure of persons and property.

2.2 FIRST AID FACILITIES

A. Provide adequate facilities for the number of employees and the hazards associated with the types of ongoing construction work at the site.

2.3 PERSONNEL PROTECTIVE EQUIPMENT

A. Meet requirements of applicable ANSI standards.

PART 3 - EXECUTION

3.1 EMERGENCY INSTRUCTIONS

A. Post telephone numbers and reporting instructions for ambulance, physician, hospital, fire department, and police in conspicuous locations at the work site.

3.2 FIRE AND LIFE SAFETY

A. Comply with the requirements of NFPA 241 (Standard for Safeguarding Construction, Alteration, and Demolition Operations).

B. Store hazardous materials in accordance with manufacturer's and OSHA recommendations. Maintain readily available, on site, SDS for each chemical.

1. Immediately report all spills of hazardous materials to the Engineer. Do not store hazardous materials adjacent to critical facilities, that including public water supply wells.
2. Maintain a spill emergency response kit.

3.3 PROTECTIVE EQUIPMENT

A. Inspect personal protective equipment daily and maintain in a serviceable condition. Clean, sanitize, and repair personal items, as appropriate, before issuing them to another individual.

B. Inspect and maintain other protective equipment and devices before use and on a periodic basis to ensure safe operation.

3.4 DAILY SAFTEY INSPECTIONS

A. Conduct daily safety inspections and maintain daily safety reports which include area/operation inspected, date of inspection, identified hazards, and corrective action(s) taken.

3.5 SAFETY MEETINGS

A. As a minimum, conduct weekly 15-minute "toolbox" safety meetings. These meetings shall be conducted by a foreman or supervisor and attended by all construction personnel at the worksite. Topics need to coincide with work scheduled for the following week. Document and submit meeting minutes to the Engineer within one day after the meeting.

B. Conduct monthly safety meetings for all levels of supervision. Meetings shall be attended by all contractors and subcontractors performing work on the site. Notify the Engineer of meeting dates and times. These meetings shall be used to review the effectiveness of the Contractor's safety effort, to resolve current health and safety problems, to provide a forum for planning safe construction activities, and for updating the Accident Prevention Plan. The Engineer's resident project representative (RPR) will attend the meeting and enter the results of the meetings into the daily log.

3.6 HARD HATS AND PROTECTIVE EQUIPMENT AREAS

A. A hard hat area shall be designated by the Contractor. The hard hat area shall be posted by the Contractor in a manner satisfactory to the Engineer.

B. It is the Contractor's responsibility to require all those working on or visiting the site to wear hard hats and other necessary personal protective equipment at all times. As a minimum, provide **6** hard hats for use by visitors.

3.7 TRAINING

A. First Aid: Provide adequate training to an adequate number of personnel to ensure prompt and efficient first aid.

B. Hazardous Material: Train and instruct each employee exposed to hazardous material in safe and approved methods of handling and storage. Hazardous materials are defined as explosive, flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful substances that could cause death or injury.

END OF SECTION 01 35 23

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements. The quality of all work shall be the responsibility of the Contractor.

1. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and control procedures that facilitate compliance with the Contract Document requirements.

2. An Engineer/Owner’s representative will be provided to witness and/or conduct quality control testing as indicate in each respective specification.

C. See Divisions 02 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the work to evaluate that actual products incorporated into the work and completed construction comply with requirements.

C. Preconstruction Testing: Tests and inspections that are performed specifically for the project before products and materials are incorporated into the work to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by a Nationally Recognized Testing Laboratory (NRTL), a National Voluntary Laboratory Accreditation Program (NVLAP), or a testing agency qualified to conduct product testing, to establish product performance and compliance with industry standards.

E. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

F. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the work and for completed work.

G. Testing Agency or Laboratory: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as “carpentry” does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

1.3 CONFLICTING REQUIREMENTS

A. Reference Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

B. Minimum Quality Levels: The quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.4 SUBMITTALS

A. Quality Control Plan:

1. After contract award and before the Pre-Construction conference, submit for approval a written Contractor Quality Control (CQC) plan.
2. If the plan requires any revisions or corrections, the Contractor shall resubmit the plan within 10 days.
3. The Owner/Engineer reserves the right to require changes in the plan during the contract period as necessary to obtain the quality specified.
4. No change in the approved plan may be made without written concurrence by the Engineer.

B. Qualification Data: For testing agencies specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

C. Contractor's Quality Control Reports: Submit showing all inspections and tests on the first workday following the date covered by the report. Quality Control Supervisor shall utilize the forms attached at the end of this Section.

D. Test Reports

1. Test reports shall be completed by the person performing the test. Manufacturer test reports shall be provided within 2-days of startup and performance testing.

2. Submit Daily Test Information Sheets with Quality Control Daily Reports.
3. Submit failing test results and proposed remedial actions within four hours of noted deficiency.
4. Submit three copies of complete test results no later than one calendar day after the test was performed.

E. Off-Site Inspection Reports: Submit prior to shipment.

F. If the CQC plan and Quality Control Reports are not submitted as specified, the Engineer may retain all payments until such time a plan is accepted and implemented.

G. Permits, Licenses, and Certificates: For Owner records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the work.

1.5 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Contractors Quality Control Staff:

1. Unless approved by Owner/Engineer, the Contractor's Quality Control Supervisor shall not also perform the duties of Superintendent, Foreman, etc. The Contractor's Quality Control Supervisor shall be dedicated to quality control, but may perform other duties such as those related to safety, schedule, submittals, RFIs, and meetings.
2. The Contractor's designated Quality Control Supervisor shall be on the project site whenever critical contract work is in progress.
3. The Contractor's job supervisory staff may be used to assist the Quality Control Supervisor supplemented, as necessary, by additional certified testing technicians.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

F. Professional Engineer Qualifications: A professional Engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing Engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

G. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the work.

H. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by Contract, is acceptable to the Engineer.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
3. All measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards in accordance with NIST requirements. Upon request, measuring and testing devices shall be made available for use by the Government for verification tests.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.6 QUALITY CONTROL

A. Comply with local and State adopted Codes (building, electrical, plumbing, public works etc.) of authorities having jurisdiction (AHJ). Contractor shall administer and schedule special tests and inspections as required by permitting agencies and AHJ.

B. The Contractor is responsible for all testing and inspections indicated within each respective specification Section.
1. In general, the following testing will be completed by Owner/Engineer:
    i. Soils compaction
    ii. Concrete slump and hardness (curing)
    iii. CMU grout hardness (curing)
    iv. Asphalt temperature and compaction
2. In general, the following testing will be completed by Contractor:
    i. Pipe leakage
    ii. Motorized equipment, by mfg. rep.
    iii. HVAC equipment systems
    iv. Electrical equipment
    v. Process equipment & SCADA systems

C. Inspect and test work as needed to ensure that the quality of materials, workmanship, construction, finish, and functional performance are in compliance with applicable specifications, drawings, and those required by the Building Code.

1. Engage a qualified testing agency to perform required quality-control services.
2. Submit the appropriate report, for each quality-control service.

3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
4. The Engineer may designate test locations.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Re-testing/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit digital PDF certified written reports of each test, inspection, and similar quality-control service through Contractor to Engineer.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the work.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

2.1 QUALITY CONTROL PLAN

A. The Quality Control Plan shall include:

1. A list of personnel responsible for quality control and assigned duties. Include each person's qualifications.
2. A copy of a letter of direction to the Contractor's Quality Control Supervisor outlining assigned duties.
3. Names, qualifications, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms.
4. Methods of performing, documenting, and enforcing quality control of all work.
5. Methods of monitoring and controlling environmental pollution and contamination as required by regulations and laws.

PART 3 - EXECUTION

3.1 OFF-SITE CONTROL

A. Items that are fabricated or assembled off-site shall be inspected for quality control at the place of fabrication.

3.2 ON-SITE CONTROL

A. Notification:

1. Notify the Engineer at least 48 hours in advance of the preparatory phase meeting.
2. Notify the Engineer at least 24 hours in advance of the initial and follow-up phases.

B. Preparatory Phase: Perform before beginning each feature of work.

1. Review control submittal requirements with personnel directly responsible for quality assurance and quantity control of the work. As a minimum, the Contractor's Quality Control Supervisor and the foreman responsible for the feature of work shall be in attendance.
2. Review all applicable specifications sections and drawings related to the feature of work.
3. Ensure that copies of all referenced standards related to sampling, testing, and execution for the feature of work are available on site.
4. Ensure that provisions have been made for field control testing.
5. Examine the work area to ensure that all preliminary work has been completed.
6. Verify all field dimensions and advise the Engineer of discrepancies with contract documents.
7. Ensure that necessary equipment and materials are at the project site and that they comply with approved shop drawings and submittals.
8. Document all preparatory phase activities and discussions on the Contractor's Quality Control Report.

C. Initial Phase:

1. As soon as work begins, inspect and test a representative portion of a particular feature of work for quality of workmanship.
2. Review control testing procedures to ensure compliance with contract requirements.
3. Document all initial phase activities and discussions on the Contractor's Quality Control Report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

D. Follow-Up Phase: Inspect and test as work progresses to ensure compliance with contract requirements until completion of work.

E. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be required on the same feature of work for the following reasons:

1. Quality of on-going work is unacceptable.
2. Changes occur in the applicable quality control staff, on-site production supervision, or work crew.
3. Work on a particular feature of work is resumed after a substantial period of inactivity.

3.3 DOCUMENTATION

A. Maintain Quality Control \Reports and Test Report Information Sheets of quality control activities and tests (attached).

B. Quality Control Reports may not be substituted for other written reports required under clauses of the contract, such as Disputes, Differing Site Conditions, or Changes.

3.4 ENFORCEMENT

A. The Contractor shall stop work on any item or feature pending satisfactory correction of any deficiency noted by the quality control staff or the Engineer.

3.5 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

CONTRACTOR'S QUALITY CONTROL REPORT

REPORT NO. _____ SHEET 1 OF _____

PROJECT: Teton Village WWTP Expansion				CONTRACT NO.	DATE
LOCATION: 7020 Rachel Way \ Teton Village, WY 83025				CONTRACTOR'S REPRESENTATIVE ON THE JOB	
WEATHER (Rain, Snow, Cloudy, Windy, etc.)	RAINFALL Inches	TEMPERATURE MAX.	TEMPERATURE MIN.	GROUND CONDITIONS (Dry, Damp, Wet, Frozen, etc.)	

1. PRIME CONTRACTOR

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY PRIME CONTRACTOR:

MATERIALS DELIVERED	OFFICIAL VISITORS TO SITE

2A. SUBCONTRACTOR, _____: (If more than one subcontractor use copies of following page.)

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

3. SPECIFIC INSPECTIONS: (Inspections performed, results, and corrective actions)

4. TESTING: ☐1 Check if any testing was performed today. (Complete and attach Test Report Information Sheets.)
Type and Location of Testing: _____

5. VERBAL INSTRUCTION RECEIVED FROM GOVERNMENT ON CONSTRUCTION DEFICIENCIES OR RE-TESTING REQUIRED:

6. REMARKS:

7. CERTIFICATION:

I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications except as may be noted above.

_____
Contractor's Quality Control Representative

SUBCONTRACTOR WORK CONTINUED:	CONTRACT NO.	REPORT NO. _____ SHEET ____ OF ____

2 SUBCONTRACTOR,

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

2 SUBCONTRACTOR,

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

2 SUBCONTRACTOR,

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	Comments

WORK PERFORMED BY SUBCONTRACTOR:

2 SUBCONTRACTOR,

NO. EMPLOYEES BY JOB CATEGORIES	Hours	HEAVY EQUIPMENT ON JOB	NO. UNITS	HRS. WORKING		
				YES	NO	COMMENTS

WORK PERFORMED BY SUBCONTRACTOR:

TEST REPORT INFORMATION SHEET

CONTRACT NO._____ REPORT NO. _____

SHEET _____ OF _____

1. Individual Making Inspection or Test:	
2. Testing Laboratory; Name:	Phone #:
Address:	
3. Description of Work and Test Method:	
4. Location of Samples and Tests or Inspections:	
5. Specification Section:	
6. Inspection or Test Data:	
7. Test Results and Interpretations of Test Results:	
8. Comments or Professional Opinion About Compliance of Inspected Work or Tested Work with contract Document Requirements:	
9. Recommendations:	
10. Corrective Actions Taken:	

CERTIFICATION:
I certify that the above testing report is complete and correct and that all testing performed this day for this contract is in strict compliance with the plans and specifications except as noted above.

_____
Signature of Inspector

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Engineer, permanent or temporary roofing is complete, insulated, and weather tight; exterior walls are insulated and weather tight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum as required.

B. Water Service: Water from existing water system is available for use specific to this project without metering and without payment of use charges. Provide all required excavation, backfill, connections and extensions of services as required for construction operations. Do not use potable water for anything other than drinking, leak/water tightness testing and moisture conditioning of soils. If not already present, Contractor shall furnish and connect to potable water supplies with utility provider approved backflow protection. On, or prior to project completion, contractor is responsible for abandoning the water service in accordance with utility provider's requirements.

C. Electric Power Service: Contractor shall provide portable power, or arrange for power service with the local utility provider. All costs to establish and disconnect shall be borne by Contractor.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with local power utility requirements, NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Environmental Protection: Provide environmental protection as required by authorities having jurisdiction and as indicated in the Contract Documents. Coordinate with requirements of the following:

1. Regulatory Requirements.
2. Noise & Acoustics Management.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ABAAS Accessibility Guidelines.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. Pavement: Comply with Section 32 12 16 "Asphalt Paving."

C. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top and bottom rails. Provide galvanized steel bases for supporting posts. Insert brown or green privacy slats in chain link.

D. Safety Barrier Fence: Orange or green plastic fence, minimum height, 4 feet. Coordinate color with the CO.

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

F. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

G. Barrier Tape: Yellow tape Imprinted with "CAUTION: CONSTRUCTION AREA", manufactured by Reef Industries, Inc., Houston, Texas, or approved equal.

2.2 TEMPORARY FACILITIES

A. Staging: The location and allowed use of staging areas are described in the drawings, typically noted within the "limits of disturbance". Comply with boundary marking requirements, topsoil stripping, material storage, and erosion control requirements of the specifications. Return all staging and stockpiling areas to pre-construction conditions following project completion. Secure the site with chain-link fencing meeting the requirements of this specification.

B. Field Offices, General: When required by Contractor; prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

C. Storage and Fabrication Sheds: Temporary weather tight sheds or other covered facilities for storage of materials subject to weather damage. Number and size of structures shall be subject to Engineer's approval.

D. Storage and Fabrication Sheds: Temporary weather tight sheds or other covered facilities for storage of materials subject to weather damage. Number and size of structures shall be subject to Owner's approval.

E. Toilets: Sufficiently lighted and ventilated toilet facilities in weatherproof, sight proof, handicap accessible, sturdy enclosures with privacy locks. Toilet wastes may be removed by a temporary sewer service connection, or collected in a portable truck-mounted waste tank for removal on a weekly basis.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Engineer authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas, fuel-oil heaters, or electric unit heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance and as directed by the Engineer.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

2. Arrange and complete disconnection of temporary facilities with private or public utility company.

B. Storm Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers as directed by authorities having jurisdiction.

C. Potable water is available on site. Make connections to existing facilities as directed by the Engineer. Facilities must be cleaned and maintained in a condition acceptable to the Engineer. At Substantial Completion, restore these facilities to condition existing before initial use. Use of potable water is limited to drinking, leak testing, disinfection and flushing of new facilities.

D. Sanitary Facilities: Provide temporary toilets, and wash facilities for use by construction personnel.

1. Place in approved locations secluded from public observation and convenient to work stations. Relocate as work progress requires.

2. Maintain and clean toilet facilities at least weekly.

3. Completely remove sanitary facilities on completion of work.

E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations, or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Use of permanent heating and ventilation system will not be allowed without written authorization from Engineer. When the permanent heating and ventilation system is approved for use as temporary heating and ventilation, pay all costs until final acceptance. Permanent heating ventilation system must be sufficiently complete, including controls, to permit safe operation

2. Provide and maintain adequate approved facilities, as required for safety and construction requirements, during the progress of the work. Provide ample clearance around stoves and heaters and all chimney and vent connections to prevent ignition of combustible material

3. Install and maintain temporary filters when air handing equipment is used for temporary heating and ventilation. Install new filters before final acceptance in addition to any extra sets of filters required. Clean coils as determined by Engineer.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: When required, provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service underground, unless otherwise indicated.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: No telephone service is available on site for Contractor's use. Make arrangements with Telephone Company to install a service(s) and pay all costs.

J. Internet Service: No internet service is available on site for Contractor's use. Make arrangements with the Internet Service Provider (ISP) to install a service(s) and pay all costs.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 50 feet of building lines. Comply with NFPA 241.

2. Maintain support facilities until near Substantial Completion. Remove structures, equipment, and furnishings, and terminate services after punch list is 100 percent completed or when directed by Engineer. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Engineer.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.

2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31, Section 31 23 23, “Fill.”

3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.

C. Traffic Controls: Erect and maintain barricades, lights, danger signals, and warning signs in accordance with Manual on Uniform Traffic Control Devices (MUTCD), Part IV, latest edition.

1. Implement a traffic control plan in accordance with Section 01 55 26. Include strategies to maintain safe and efficient traffic flow.

2. Protect existing site improvements to remain including curbs, pavement, and utilities.

3. Maintain access for fire-fighting equipment and access to fire hydrants.

4. Illuminate barricades and obstructions at night; keep safety lights burning from sunset to sunrise.

5. Adequately barricade and post open cuts in or adjacent to thoroughfares.

6. Protect pedestrian traffic by guardrails or fences.

7. When pedestrian traffic is detoured onto a roadway, provide temporary walkways with protection as required at ends and overhead. For walkways, use temporary gravel surfacing and provide ramps at changes of elevation.

8. Cover pipes, hoses, and power lines crossing sidewalks and walkways with troughs using beveled edge boards.

9. Install Barrier Tape where directed by Engineer. Keep a minimum of two rolls on site at all times

D. Parking: Use designated areas of existing parking areas for construction personnel. To the greatest extent possible, Contractor shall limit vehicular traffic to and from work sites within the project area by requiring workers to carpool.

E. Complete all snow removal within the construction limits. Stockpile snow within the limit of disturbance, or legally offsite when space is limited.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.

2. Remove snow and ice as required to minimize accumulations.

3. Comply with Section 31 23 19 “Dewatering”.

G. Temporary Signs: Provide temporary construction notification and directional signs to direct traffic around or away from construction. Fence, barricade, or otherwise block off the immediate work area to prevent unauthorized entry.

1. Implement measures to close and/or redirect traffic in areas that will be affected by construction to ensure occupant health and safety. Provide information on alternatives that will help Owner’s personnel and visitors achieve their goal while staying away from the work area.

2. Provide temporary, directional signs for site occupants.

3. Maintain and touchup signs so they are legible at all times.

4. Erect and maintain sufficient detour signs at road closures and along detour routes.

H. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Food related waste shall be disposed of in bear proof containers. Comply with requirements of authorities having jurisdiction.

I. Concrete Washout Facility: Contractor shall provide a full containment system for washout and cleaning of concrete and flofill delivery trucks.

1. Submit plans detailing the size, materials and equipment to construct the facility.

2. Design the washout facility with sufficient holding capacity for containment of all liquid and concrete generated by washout operations. Design the facility with sufficient freeboard to prevent overflow.

3. Washout facility shall be constructed in the construction or staging areas in a location approved by the Engineer.

   a. Unless directed otherwise, locate facility a minimum of 50 feet from drain inlets, open drainage facilities and watercourses.

4. Collect and dispose of wash water and concrete debris within 24 hours of utilizing the wash water facility.

5. Inspect facility for leaks and damage before and after use and on a daily basis when in use. Repair facility damage immediately upon discovery.

6. Remove washout facility when concrete operations are discontinued.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Equipment: Provide construction equipment with the best available technology for sound dampening muffler and exhaust systems.

B. Equipment Emissions: To save fuel and reduce noise and emissions, Contractor shall develop and implement Emissions Reduction Plan to prevent excessive idling of all vehicles used in construction.

C. Temporary Erosion and Sedimentation Control: Protect on and off-property facilities by installing erosion control measures and using best management practices. When noted, comply with requirements in the drawings.

D. Oil and Hazardous Substances: Storage of hazardous materials is not allowed on-site.
   1. Comply with federal and state regulations for the storage, handling, and disposal of all hazardous material and waste. If hazardous materials will be used on site, make provisions for storage, containment, and disposal.
   2. Inspect equipment for leaks of oil, fuels, antifreeze or hydraulic fluids before and during use to prevent soil and water contamination.
   3. Do not use equipment that is leaking fluids. Repair leaks on equipment immediately. Keep a supply of absorbent materials at the job site in the event of spills. Acceptable absorbent materials are those manufactured specifically for the containment and clean-up of hazardous materials.
   4. Store hazardous spill containment devices at the work site when working within 5 meters of a body of water.
   5. Immediately notify the Engineer of all hazardous spills. Hazardous spills next to critical facilities such as water supply wells require immediate action/remediation.

E. Barricades, Warning Signs, and Lights: Comply with requirements of MUTCD, part IV, 2003 edition for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, public viewing, other construction operations, and similar activities.

G. Dust Control: Water site during dry periods to prevent excess dust. Complete water activities when requested by Engineer.

1. Utilize dust control methods such as watering, covering haul roads and controlling speeds in disturbed areas.

H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Responsible Person: A capable and qualified person shall be placed in charge of fire protection. The responsibilities shall include locating and maintaining fire protective equipment and establishing and maintaining safe torch cutting and welding procedures.

2. Smoking: Smoking within buildings or temporary storage sheds is prohibited.

3. Burning: Burning of material, including construction waste, is prohibited.

4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of Engineer. Check with park; many require “burn permits” for welding.

5. Develop and supervise an overall fire-prevention and protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

6. Hazard Control: Take all necessary precautions to prevent fire during construction. Do not store flammable or combustible liquids in existing buildings. Provide adequate ventilation during use of volatile or noxious substances.

7. Spark Arresters: Equip all gasoline or diesel powered equipment used during periods of potential fire hazards or in potential forest and grass fire locations with spark arresters approved by the USDA Forest Service.

a. Written determinations of periods and areas of potential fire hazard will be issued by Engineer.

8. Buildings: Furnish a minimum of one extinguisher for each 1,500 square feet of area or major fraction thereof.

a. Travel distance from any work station to the nearest extinguisher shall not exceed 75 feet.

9. Vehicles and Equipment: Provide one extinguisher on each vehicle or piece of equipment.

I. Service and Refueling Areas: Refueling of equipment is limited to the use of pre-loaded fuel trucks with 150-gallon tanks. The handling and design of fueling devices shall comply with O.S.H.A. Comply with the following:

1. Minimize onsite fueling and maintenance.

2. Refuel equipment at least 50 feet from buildings.

3. Refuel equipment at least 100 feet from potable water supply wells.

4. Refuel equipment at least 300 feet from waterbodies when feasible.

5. Two persons shall be utilized during fueling operations, one to operate the fuel nozzle and one on standby at the fuel truck ready to take any necessary actions to prevent any spills.

6. Ensure all necessary precautions are taken to ensure no spills will occur.

7. Report and dispose of contaminated soils according to Federal, State, and local regulations. Follow the Hazardous Spill Plan as described in this specification.

J. Nighttime Operations: Provide overhead lighting at road closure points for Owner informational officers during closures.

K. Site Enclosure Fence: Before construction operations begin, furnish and install slatted (neutral color – brown/green) chain link fencing in a manner that will prevent people and animals from easily entering the site except by entrance gates. Install fencing along the "limit of disturbance" lines shown in the drawings.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient by the Owner/Engineer to accommodate construction operations.

L. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Security of the project site and all associated costs resulting from the lack of security shall be the responsibility of the Contractor.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Unless otherwise indicated, materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.

2. At Substantial Completion, clean and renovate permanent facilities used during construction period.

3. Prior to final completion, close-out construction permits and or transfer to Owner.

END OF SECTION 01 50 00

SECTION 01 55 26 – TRAFFIC CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes traffic control requirements for construction of new facilities, including, but not limited to following:
   1. Traffic control planning to accommodate construction operations.
   2. Installation and maintenance of traffic control signs, barricades, and warning devices.
   3. Flag persons to direct traffic through, or around the project.
   4. Development of a “TRAFFIC CONTROL PLAN” for both vehicular and foot traffic.

B. Related Sections:
   1. Section 01 11 00 "Summary of Work"
   2. Section 01 33 23 " Submittal Procedures"
   3. Section 01 50 00 "Temporary Facilities and Controls"

1.3 SUBMITTALS

A. The Contractor shall submit a “TRAFFIC CONTROL PLAN” or modifications to the plan provided in the construction documents prior to commencing construction. Prepare temporary traffic control plan conforming to the current edition of the Manual of Uniform Traffic Control Devices (MUTCD), published by the U.S. Department of Transportation, Federal Highway Administration, and conforming requirements of the local AHJ. No plan may be implemented until approved by the Engineer.

B. The traffic control plan shall include roadways, parking lots, sidewalks and pathways affected by construction.

C. Comply with Section 01 33 23, “Submittal Procedures.”

PART 2 - PRODUCTS

2.1 MATERIALS

A. Temporary traffic control equipment and signs shall conform to the current edition of the Manual of Uniform Traffic Control Devices (MUTCD), published by the U.S. Department of Transportation, Federal Highway Administration.

PART 3 - EXECUTION

3.1 REQUIREMENTS

A. Complete all snow removal within the construction limits.Stockpile snow in Owner/Engineer approved locations, or remove from site in accordance with Section 01 50 00.

B. Obtain all required permitting from authorities having jurisdiction (AHJ) for partial, or full closure, of public access ways.

C. Single-lane traffic shall be maintained within public streets and private driveways at all times unless approved otherwise. Temporary two-lane, or full street closures will be permitted when required upon specific approval of Engineer/Owner. Traffic delays associated with partial closures should be kept to a 10-minutes or less. Flaggers must be present to direct traffic during these periods.

D. Prioritize passage of emergency and special needs staff at all times.

E. Install portable chain link fencing to direct foot and vehicular traffic away from open excavation within the construction area.

F. The Contractor shall be responsible for providing 48-hour advance notice in writing to affected residents in cases of periodic local access closures.

G. Develop traffic control plan and implement measures to reduce adverse effects of construction on staff, residents and visitors' health and safety.

H. Construction shall be performed and phased to minimize disruption to traffic.

I. When applicable, provide access to Owner's personnel responsible for maintaining and operating existing facilities.

J. Maintain access for firefighting equipment and access to fire hydrants.

K. Contractor shall provide the Engineer a minimum of 7 days advance notice to any work scheduled that will block access to fire facilities.

L. Emergency and special needs traffic shall be accommodated immediately at any location at any time.

M. Modify the traffic control plan as needed, if current operations are obviously inadequate to protect the public and/or accommodate traffic volumes or the construction activities.

N. Provide 24-hour emergency telephone number of person responsible for implementing and maintaining the traffic control plan.

O. Provide traffic control devices and flag persons as needed considering the site condition and construction activity. Flag persons shall be adequately trained and shall be certified by successful completion of a traffic control-training course.

P. Initiate hazard signals for trucks traveling less than 10 mph, utilize flag persons to direct traffic flow.

3.2 EXECUTION

A. Traffic Controls: Comply with requirements of AHJ.

B. Furnish and install necessary traffic control signs and devices. Maintain and touchup signs so they can be easily seen and legible at all times.

C. Provide other signs as required to inform public and individuals seeking entrance to Project.

D. Provide temporary directional signs for construction personnel, Owner's Staff and visitors.

E. Provide flag persons when necessary to direct traffic through or around the project.

F. Maintain and modify temporary traffic control equipment as needed to accommodate traffic level and construction operations.

G. Repair or replace temporary traffic control equipment damaged by the public, or the construction operations.

H. Remove all traffic control equipment upon completion of construction operations.

END OF SECTION 01 55 26

SECTION 01 57 19.12 – NOISE & ACCOUSTICS MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Special requirements for noise and acoustics management during deconstruction and construction operations.

2. Project Specific: The Project site is partially located within a public park that is boarded by a residential neighborhood. Management of construction noise, foul language, music, etc. is imperative to limiting disputes and the overall success of this project. Contractor shall make concerted efforts to limit construction noise through careful scheduling. Work is allowed to commence in accordance with the work hours below, however it is asked to the extent that it is possible that obtrusive noise after 6pm is limited.

1.2 DEFINITIONS

A. Ambient noise level: The total noise associated with a given environment, being usually a composite of normal or existing sounds from all sources near and far, excluding the noise source at issue.

B. Daytime: The hours from 7 a.m. to 7 p.m. on weekdays and 8 a.m. to 5 p.m. on weekends and holidays.
1. Schedule noise-producing work in less sensitive hours of the day or week as directed by the Engineer. Work is allowed to commence in accordance with the work hours above, however it is asked to the extent possible that noise can be limited prior to 7:30am and after 6pm.

C. Nighttime: All non-daytime hours.

D. Property line: The real or imaginary line along the ground surface and its vertical extension, which separates real property owned or controlled by one person from contiguous real property owned or controlled by another person or from any public right-of-way or from any public space.

E. Receiving noise area: Any real property where people live or work and where noise is heard, excluding the project or source area.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 NOISE MANGEMENT

A. When applicable, comply with noise levels as required by authorities having jurisdiction (AHJ).

B. Noise Control: Perform deconstruction and construction operations to minimize noise. Schedule noise-producing work in less sensitive hours of the day or week as directed by the Engineer.

C. Repetitive and/or intermittent, high-level noise: Permitted only during Daytime.

1. Do not exceed the following dB(A) limitations at 50 feet:

Sound Level in dB(A)	Time Duration of Impact Noise
70	More than 15 minutes in any hour
80	More than 10 minutes in any hour

2. Maximum permissible construction equipment noise levels at 50 feet:

EARTHMOVING	dB(A)	MATERIALS HANDLING	dB(A)
Front Loaders	75	Concrete Mixers	75
Backhoes	75	Concrete Pumps	75
Dozers	75	Cranes	75
Tractors	75	Derricks Impact	75
Scrapers	80	Pile Drivers	95
Graders	75	Jack Hammers	75
Trucks	75	Rock Drills	80
Pavers, Stationary	80	Pneumatic Tools	80
Pumps	75	Saws	75
Generators	75	Vibrators	75
Compressors	75		

D. Ambient Noise:

1. Maximum noise levels (dB) for receiving noise area at a distance of 50 feet from occupied buildings shall be as follows:

a. Residential housing areas — Daytime: 65 dB; Nighttime: 45 dB

b. Office/Administrative/Commercial buildings and areas — Daytime: 67 dB; Nighttime: 65 dB

2. In the event the existing local ambient noise level exceeds the maximum allowable receiving noise level (dB), the receiving noise level maximum for construction operations shall be adjusted as follows:

a. Residential housing areas: Maximum 3 additional dB above the local ambient as measured at 50 feet from occupied buildings.
b. Office/Administrative/Commercial buildings and receiving areas: Maximum 5 additional dB above the local ambient as measured 50 feet from occupied buildings.

3.2 FIELD QUALITY CONTROL

A. If there are noise concerns adjacent to the work area, Contractor shall assess potential effects of construction noise on adjacent neighbors and offices at the direction of the Engineer. Assess noise impacts in accordance with ASTM E1686 and as follows:

1. Ambient noise measurement: Measure at 50 lineal feet from the building wall closest to construction at a height of at least four (4) feet above the immediate surrounding surface. Average the ambient noise level over a period of at least 15 minutes.
2. Ambient noise measurement at urban sites: Conduct during morning peak traffic hour between 7 A.M. and 9 A.M. and afternoon peak traffic hour between 4 P.M. and 6 P.M. In addition, conduct a 24-hour measurement at the proposed project site to document the noise pattern throughout the day. Adjust and weight for seasonal and climatic variations.

B. Monitor noise produced from construction operations in accordance with ASTM E1780.

END OF SECTION 01 57 19.12

SECTION 01 67 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; and special warranties.

1.2 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design" or “approved equal”, including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 SUBMITTALS

A. Record Submittals as specified in Section 01 33 23 – Submittal Procedures.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weather tight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Comply with “Special” and/or ‘Supplemental Conditions” within the Project contract documents; requirements may include product certification for compliance with American Iron & Steel (AIS), Buy America, sustainability, environmental, or other product requirements.

B. Product Selection Procedures:

1. Product: Where Specifications or Drawings name a single product and manufacturer, provide the named product that complies with requirements or approved equal.
2. Manufacturer/Source: Where Specifications or Drawings name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements or approved equal.
3. Products: Where Specifications or Drawings include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements or approved equal.
4. Manufacturers: Where Specifications or Drawings include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements or approved equal.
5. Available Products: Where Specifications or Drawings include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications or Drawings include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed

manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.

7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product, system, or approved equal.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers, or approved equal. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Engineer's/Architect's sample. Engineer's decision will be final on whether a proposed product matches.

    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Engineer will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects/engineers and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION

3.1 PROTECTION AFTER INSTALLATION

A. Provide adequate coverings as necessary to protect installed materials from damage resulting from natural elements, traffic, and subsequent construction. Remove when no longer needed.

END OF SECTION 01 67 00

SECTION 01 71 13

MOBILIZATION

PART 1 GENERAL – NOT USED

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

PART 4 MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT

A. For measurement of “Mobilization” see Section 01 27 00 – Definition of Contract Line Items

4.2 BASIS OF PAYMENT

A. For payment for “Mobilization” see Section 01 27 00 – Definition of Contract Line Items

END OF SECTION

SECTION 01 73 40 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Coordination with utility service providers.
2. Construction layout.
3. Field engineering and surveying.
4. General examination, preparation and installation of products.
5. Progress cleaning.
6. Starting and adjusting of systems
7. Protection of installed construction.
8. Correction of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locating Utilities:
1. Underground utility locations indicated on the drawings are provided from information supplied by the various utility companies, or are taken from record plans and are intended to reflect the general location of underground facilities. No warranty of accuracy of the provided information is implied.
2. By Wyoming Law, Contractor is required to call One Call of Wyoming at least two business days prior to digging.
    a. Phone: 1(800)849-2476
3. Coordinate with the Engineer/Owner, location of Owner's utilities. Notify Engineer/Owner of the need to locate facilities five working days before performing Work.
    a. Request underground utilities to be located and marked within the construction area.
    b. Verify utility locations indicated on the drawings within the construction limits.
    c. Verify safe working distances from the existing utilities considering the construction operations to be utilized.
    d. Verify depth and location of any existing utilities that have potential to conflict with the work including points of connection for buried water, sewer, gravity, storm sewer, culverts, telephone, fiber communications and electrical.

e. Notify Engineer of any utility conflicts that are not adequately addressed in the project construction plans and specifications.
f. Coordinate with each utility as needed to shut down the service as required to construct the work and to facilitate any upgrade or relocation work to be performed by the utility.
g. Record existing utility locations that are incorrect or not shown on the drawings. Information shall be included in the record drawings.
h. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
i. Protect existing utilities to prevent damage during construction.

4. Contractor shall be responsible for locating and preventing damage to known utilities. If damage occurs, repair utility at no additional expense to the Owner. Provide repair materials and fittings onsite during construction for immediate repair of damaged water mains.
5. If damage occurs to an unknown utility, repair utility. An equitable adjustment will be made in accordance with the Changes clause of the contract. Coordinate with all utility providers to locate existing buried utility facilities within the project.

B. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

C. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

D. Examine and verify specific conditions described in individual Specification Sections.

E. Verify that utility services are available with correct characteristics and in correct locations.

3.2 COORDINATION WITH UTILITY SERVICE PROVIDERS

A. Coordination with Utility Service Providers: As necessary, contact the utility service providers sufficiently in advance of Work to avoid delay. Coordinate your portion of the work, testing requirements, inspections, utility connection fees, and off-site utility improvements required to serve the project.

3.3 PREPARATION

A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control

of the Contractor, submit a request for information to the Engineer in accordance with Division 01 Specification 01 31 00 “Project Management and Coordination”.

D. Clean substrate surfaces prior to applying next material, substance or equipment in accordance with manufacturer's instructions.

3.4 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the existing benchmarks. If discrepancies are discovered, notify Engineer promptly.

B. General: Owner will provide a licensed land surveyor to provide layout of the Work. Surveyor will:
   1. Establish benchmarks and control points to set lines of construction and elsewhere as needed to locate each element of Project.
   2. Establish dimensions within tolerances indicated.
   3. Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

   Contractor shall:
   1. Inform installers of lines and levels to which they must comply.
   2. Check the location, level and plumb, of every major element as the Work progresses.
   3. Notify the Engineer when deviations from required lines and levels exceed allowable tolerances.
   4. Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Owner.

3.5 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points established by Owner’s surveyor during construction operations. Controls that are destroyed by Contractor will be replaced by the Contractor at their expense.

   1. Existing Monuments: All bench marks, land corners, and triangulation points, established by other surveys, existing within the construction area shall be preserved. If existing monuments interfere with the work, secure written permission before removing them.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on the Project site, referenced to data established by survey control points. Comply with Owner requirements for type and size of benchmark.

   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

3.6 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.

C. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels to site occupants. Wear ear protection in accordance with 29 CFR 1910.95(i)(1) of OSHA.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Engineer for final decision.

J. Allow for expansion of materials and building movement.

K. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project. Maintain conditions required for product performance until Substantial Completion.

1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.

L. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.

1. Refer questionable mounting heights choices to Engineer for final decision.
2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.

M. Adjust operating products and equipment to ensure smooth and unhindered operation.

N. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

O. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

P. Quantity surveys: Shall be conducted, and the data derived from these surveys shall be used in computing the quantities of work performed and the actual construction completed and in place.

1. The Contractor shall conduct the original and final surveys and surveys for any periods for which progress payments are requested. All these surveys shall be conducted under the direction of a representative of the Engineer, unless the Engineer waives this requirement in a specific instance. The Owner shall make such computations as are necessary to determine the quantities of work performed or finally in place. The Contractor shall make the computations based on the surveys for any periods for which progress payments are requested.
2. Promptly upon completing a survey, the Contractor shall furnish the originals of all field notes and all other records relating to the survey or to the layout of the work to the Engineer, who shall use them as necessary to determine the amount of progress payments. The Contractor shall retain copies of all such material furnished to the Engineer.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
3. Contractor shall provide progress cleaning that minimizes sources of food, water, and harborage available to pests. Comply with Section 01 50 00 “Temporary Facilities and Controls.”

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted. Contractor shall dispose of wastes legally offsite.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

K. Final Cleaning: At completion of Work, remove all remaining waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces; leave Project clean and ready for occupancy.

1. Provide final cleaning in accordance with ASTM E1971.

3.8 STARTING OF SYSTEMS

A. Coordinate schedule for startup of various equipment and systems.

B. Notify Engineer 7 days prior to startup of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify that tests, meter or level readings, and electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Inspect all instrument and control loops with Engineer and address operation and performance concerns.

G. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.

H. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at the Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.
   1. Provide written directions to Contractor detailing all corrections necessary for proper operation.
   2. Submit a written report according to Section 01 33 23 - Submittal Procedures, that equipment or system has been properly installed and is functioning correctly.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

END OF SECTION 01 73 40

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Project Record Drawings.
2. Closeout Submittals.
3. Substantial Completion and Final Inspection.
4. Warranties.
5. Final Acceptance of the Work

1.2 PROJECT RECORD DRAWINGS

A. Maintain one complete full-size set of contract drawings and one full-size set of vendor-supplied drawings. Clearly mark changes, deletions, and additions to show actual construction conditions. Show additions in red, deletions in green and special instructions in blue.

B. Keep record drawings current. Make record drawings available to the Engineer for inspection at the time of monthly progress payment requests. If project record drawings are not current, the Engineer may retain an appropriate amount of the progress payment.

C. On completion of the total project, submit complete record drawings in .PDF format. Include all shop drawings, sketches, and additional drawings that are to be included in the final set, with clear instructions showing the location of these drawings.

1.3 CLOSEOUT SUBMITTALS

A. A list of closeout requirements has been attached at the end of the Division 1 specifications for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract still require you to satisfy the requirements of the individual specification sections regardless of what is shown on the list. Submit the following before requesting final inspection:

1. Submit specific warranties, guarantees, workmanship bonds, final certifications, and similar documents.
2. Submit Owner required forms for occupancy, Teton County Building Department acceptance, and any other similar forms or certificates.
3. Submit Project Record Documents, operation and maintenance manuals, final completion construction digital images recorded on CD-R or DVD-R or transferable via. other agreed on method, with index and descriptions, and similar final record information.
4. Commissioning Report: As specified in Section 01 91 14 - Commissioning.

5. Posted Operating Instructions: As specified in the individual sections. Furnish operating instructions attached to or posted adjacent to equipment. Include wiring diagrams, control diagrams, control sequence, start-up, adjustment, operation, lubrication, shut-down, safety precautions, procedures in the event of equipment failure, and other items of instruction recommended by the manufacturer.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Engineer. Label with manufacturer's name and model number where applicable.
    a. Special Tools: One set of special tools required to operate, adjust, dismantle, or repair equipment. Special tools are those not normally found in possession of mechanics or maintenance personnel.
7. Keys and Keying Schedule: Submit all keys including duplicates. Wire all keys for each lock securely together. Tag and plainly mark with lock number, equipment identification, or panel or switch number, and indicate location, such as building and room name or number.
8. Make final changeover of permanent locks and deliver keys to Engineer. Advise Owner’s operating personnel of changeover in security provisions.
9. Submit approved pre-functional checklists and functional performance testing reports from the commissioning documentation.
    a. Equipment start-up requires coordination with the commissioning process. Equipment shall not be “temporarily” started for commissioning.
10. Submit test and balance report.
11. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
14. Instruct Owner personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videos.

1.4 SUBSTANTIAL COMPLETION AND FINAL INSPECTION

A. When project, or designated portion of project, is substantially complete, request in writing a final inspection. Upon receipt of written request that project is substantially complete, the Engineer will proceed with inspection within 10 days of receipt of request or will advise the Contractor of items that prevent the project from being designated as substantially complete.

B. If, following final inspection, the work is determined to be substantially complete, Engineer will prepare a Punch List to be corrected before final acceptance and issue a Letter of Substantial Completion. Contractor shall complete the work described on the Punch List within 30 calendar days, as weather permits. If the Contractor fails to complete the work within this time frame, the Engineer may either replace or correct the work with an appropriate reduction in the contract price or charge for re-inspection costs in accordance with the Inspection of Construction clause of the contract.

C. If, following final inspection, the work is not determined to be substantially complete; Engineer will notify Contractor in writing. After completing work, Contractor shall request a new final inspection. All re-inspection costs may be charged against the Contractor in accordance with the Inspection of Construction clause of the contract.

1.5 FINAL ACCEPTANCE OF THE WORK

A. Prior to requesting inspection for verification of completion of all outstanding items:

1. Complete commissioning requirements of Section 01 91 14 unless otherwise approved in writing by the Engineer. Exceptions to this are required seasonal and approved deferred testing.

B. After all deficiencies have been corrected, a Letter of Final Acceptance will be issued.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual. Provide warranties in both hard and digital copies.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at the beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. See Division 01 Specification Section 01 73 40 “Execution” for information on cleaning agents.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Sweep concrete floors broom clean in unoccupied spaces.
i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
k. Remove labels that are not permanent.
l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint, dust, mortar droppings, and other foreign substances.

n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
q. Leave Project clean and ready for occupancy.

A. Waste Disposal: Remove and dispose or wastes legally offsite.

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Manuals, General.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of systems and equipment.

B. See Divisions 02 through 49 Sections for additional operation and maintenance manual requirements for the Work in those Sections.

1.2 SUBMITTALS

A. Manual: Submit one copy of each manual in draft digital (pdf) form at least 30 days before substantial completion. Engineer will return digital copy with comments within 15 days of receipt.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each product manual into a composite electronically indexed file. Submit on digital media acceptable to Engineer.

   a. Name each indexed document file in composite electronic index with applicable tag noting process area (080, 290, 521, etc) and item name. Include a complete electronically linked operation and maintenance directory.
   b. Enable inserted reviewer comments on draft submittals.

2. Correct or modify each manual to comply with Engineers comments. Submit two (2) hard copies of each corrected manual within 15 days of receipt of Engineers comments. Deliver two (2) USB thumb drives with all O&M Manuals for the project.

1.3 QUALITY ASSURANCE

A. Coordinate with Section 01 91 14 on Commissioning. The Commissioning Agent shall review the Operation and Maintenance Manuals for systems that were commissioned.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Project Title.
2. Location w/ Process Tag Series (010, 900,1000, etc.)
3. Contract Number.
4. Prime Contractors Name, Phone and Address.
5. Equipment Suppliers Name, Phone and Address
6. Date of Substantial Completion.
7. Binder Volume number.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to the process tag series (see process drawings) and Specification Section number in the Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder; i.e., complete O&M for “Well 9”.

1. Binders: White, commercial quality, hard back, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic window sleeve on front and spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. Cover Sheet: Identify each binder on front and spine, with the project title, location, Engineer’s project number, prime contractor's name and address, date of substantial completion, and binder volume number. Insert cover sheet into clear plastic view pocket on front of binder. Insert sheet into clear plastic view pocket on spine with title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Data: Fill binders to no more than 75 percent of capacity. Punch holes shall not obscure any data. When the contents of a single tabbed section covers more than one item, provide colored paper sheets to separate the data for each item.

a. Manufacturers' Data: Provide originals for color or copyrighted data. Black and white data may be originals or clean, good quality reproductions. Copies produced by facsimile transmission and sheets with stamps, such as submittal approval stamps, will not be acceptable. Include only sheets that apply to items installed; cross out inapplicable data.

b. Vendor Furnished As-Built Drawings: Maximum 22-inch by 34-inch sheets with minimum character or lettering size of 1/8 inch. Reduced-size reproductions may be provided instead of full-size drawings if the reproductions are clear and legible. If reduced-size drawings are used, identify as "REDUCED SIZE" and provide graphic scales, if applicable.
c. Custom Data: Data supplemented by drawings and schematics necessary to describe systems adequately.
d. Equipment Data Sheet: Data, using form at the end of this section.
e. Schedules: Schedules reflecting final, as-installed conditions.
f. Data that is poorly reproduced or in any way illegible will be rejected.

3. Dividers: Divider sheets with Mylar reinforced edges and pre-printed numbered tabs aligned with numbers and title lines on index sheet. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to process tag series, Specification Section number and title of Project Manual.
4. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for type of emergency, emergency instructions, and emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component for fire, flood, power failure, equipment failure and chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities to Owner’s operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include instructions on stopping, shutdown instructions for each type of emergency, operating instructions for conditions outside normal operating limits, and required sequences for electric or electronic systems.

2.3 OPERATION AND MAINTENANCE MANUALS

A. Operation Requirements

1. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards,

operating procedures, operating logs, wiring and control diagrams, and license requirements.

2. Descriptions: Include the following:
   a. Process tag series (if any - see Process Drawings)
   b. Project Specification Number
   c. Product name and model number.
   d. Manufacturer's name.
   e. Equipment identification with serial number of each component.
   f. Equipment function.
   g. Operating characteristics.
   h. Limiting conditions.
   i. Performance curves.
   j. Engineering data and tests.
   k. Complete nomenclature and number of replacement parts
   l. On-site Tests and Inspection Reports
   m. Product warranty

3. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.
4. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed. Include process and instrumentation (PID) control loops.
5. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

B. Maintenance Requirements for Systems and Equipment

1. Content: For each system, subsystem and piece of equipment not part of a system include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, and equipment data sheets as described below.
2. Source Information: List each system, subsystem, and piece of equipment included in the manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
3. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:
4. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, adjusting instructions, and demonstration and training videotape if available, that detail essential maintenance and environmental procedures.
5. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
6. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

7. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in the manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Include manufacturer and in-field startup and testing reports.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video. Comply with Section 01 79 00 – Demonstration and Training.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 GENERAL

A. At start of project, begin accumulating operation and maintenance data and initiate an index. Install and index all data in binders within 30 days after delivery of items. As custom written data and test results are produced, add them to the operation and maintenance data file.

B. A list of Operation and Maintenance requirements has been attached at the end of the division 01 specifications for Contractor’s convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract still require

Contractor to satisfy the requirements of the individual specification sections regardless of what is shown on the list.

C. Keep operation and maintenance data current. Make operation and maintenance binders available to the Engineer for inspection at the time of monthly progress payment requests. If operation and maintenance binders are not current the Engineer may retain an appropriate amount of the progress payment.

3.2 MANUAL PREPARATION

A. Manual Types

1. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
2. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
3. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manual Contents: Including but not limited to:

1. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
2. Custom Written Data: For data not in manufacturer's standard literature, provide text, drawings, and schematics specifically applicable to installed systems. Include step-by-step descriptions of operating procedures; identification of individual components and their functions; descriptions of how system components relate to one another and operate together to accomplish a common process or function; and sequence of operation for system control circuits. For seasonally operated systems, provide start-up and shutdown instructions.
3. Equipment Data Sheets: For each item of equipment included in the operation and maintenance data, provide an Equipment Data Sheet using the form at the end of this section. For equipment consisting of a driven machine and a driver (for example, a pump and a motor), the equipment data shall cover both the driven machine and the driver. For similar type equipment (for example, multiple pumps of the same model and type), provide a single equipment data sheet with an attached schedule listing the individual equipment items.
4. Reports: Provide manufacture and in-field startup and testing reports.
5. Vendor Furnished As-Built Drawings: Provide for each electrical and each mechanical control system.

    a. For each control system, provide control circuit schematic drawings. Identify each wire and terminal block number. Show terminal numbers on all control devices. Show control wires and devices remote from the control panel.

b. For each control panel, provide a general arrangement drawing showing location of each control component and terminal block on the panel front and interior. Include a materials list of all panel-mounted control components as well as field-installed control components remote from the panel, identifying components, manufacturer, model number, and initial set points or sensing ranges of devices where applicable.
c. For packaged equipment systems, provide general arrangement drawings showing interrelationships of the various items of equipment and components.
d. In addition to the control wiring schematic, provide a power wiring schematic drawing showing the power flow to each motor. Identify each power conductor. Show all over-current protection and motor starting devices.

C. Comply with Division 01 Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

EQUIPMENT DATA SHEET

Equipment Item: _____ Designation: _____

Function: _____

Location: _____

Project: _____

Model No.: _____ Serial No.: _____

Manufacturer Address and Phone:	Supplier Address and Phone:

Preventive Maintenance Tasks:

Nameplate Data:

Spare Parts Furnished and Other Information:

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for instructing Owner personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment, including environmental considerations.
3. Demonstration and training video.

B. See Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.2 GENERAL REQUIREMENTS

A. A list of System Demonstration and Training requirements has been attached at the end of the Division 01 specifications, “Closeout and Operation and Maintenance Requirements”, for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract still require you to satisfy the requirements of the individual specification sections regardless of what is shown on the list.

1.3 SUBMITTALS

A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. For each training session, the Contractor shall submit for approval a proposed outline of the subjects to be covered. The training shall not be conducted until the outline is approved.

B. Demonstration and Training Video: Submit two copies of each on USB jump drive, or other digital means approved by engineer, for all training sessions within seven days of end of each training module.

1. Label each file with the date of demonstration or training, the instructor's name, and provide an index of the contents. The index shall list the start and end time of each subject covered during the training session. The sequence of the training subjects shall follow the sequence listed in the approved training outline or as actually conducted

1.4 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01, Section 01 40 00 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Engineer.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include system and equipment descriptions, operating standards, regulatory requirements, equipment function, operating characteristics, limiting conditions, and performance curves.
2. Documentation: Review emergency, operations, and maintenance manuals; Project Record Documents; identification systems; warranties and bonds; and maintenance service agreements.
3. Emergencies: Include instructions on stopping; shutdown instructions; operating instructions for conditions outside normal operating limits; instructions on meaning of warnings, trouble indications, and error messages; and required sequences for electric or electronic systems.
4. Operations: Include startup, break-in, control, and safety procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; operating procedures for emergencies and equipment failure; and required sequences for electric or electronic systems.
5. Adjustments: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
8. Repairs: Include diagnosis, repair, and disassembly instructions; instructions for identifying parts; and review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Engineer for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner through the Engineer with at least seven days' advance notice.
2. Conduct training sessions after the equipment or system has been accepted and turned over to the Owner. Coordinate with commissioning requirements.
3. Individual sections specify the duration of training required. If no duration is listed, provide training of sufficient duration to adequately cover the subjects.

3.2 DEMONSTRATION AND TRAINING VIDEO

A. General: Engage a qualified personnel to record demonstration and training video. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video Format: Universal Serial Bus (USB) thumb storage drive, or other engineer approved digital media format.

C. Video Recording: Record all of the above sessions with high resolution equipment. The instructor's voice shall be clearly audible and understandable on the resulting video. Utilize a supplemental microphone worn by the instructor

D. Narration: Describe scenes on video by audio narration by microphone while or dubbing audio narration off-site after video is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction and elevation or story of construction.

1. Videos consisting of poor video or audio quality may be rejected by Engineer and the training recorded again.

END OF SECTION 01 79 00

SECTION 01 91 14 – TOTAL BUILDING COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. The work included under this section includes a complete and thorough investigation of equipment and systems indicated in Part 3 of this section. In order to ensure proper installation and operation of all components and systems the Contractor shall perform commissioning as described herein and collaborate with the commissioning authority to accomplish the tasks, and goals of commissioning. Systems to be evaluated include but are not limited to the following:

1. HVAC components and equipment.
2. HVAC system: Interactions of ventilation and heating.
3. Well Pump & Motor
4. Chemical Booster Pumps
5. Chemical Treatment and Disinfection Systems
6. Controls & SCADA: Verification that system controls and programing are operating in accordance with Section 25 51 00 – Integrated Automation Control of Facility Equipment.
7. Electrical and Alternative Energy Systems (diesel generator)
8. Access Control/ Security Systems

B. Owner personnel, Architect/Engineer, and Commissioning Authority are not responsible for construction means, methods, job safety, or management function related to commissioning on the job site.

C. Related Sections:

1.	01 31 00	“Project Management”
2.	01 40 00	“Quality Requirements”
3.	01 77 00	“Close-Out Procedures”
4.	01 78 23	“Operation & Maintenance Data”
5.	01 79 00	“Demonstration and Training”

1.2 DEFINITIONS

A. Basis of Design (BoD) - The basis of design is the documentation, from the designer, of the primary thought processes and assumptions behind design decisions. The basis of design describes the systems, components, conditions and methods used in the design.

B. Total Building Commissioning (TBC): TBC is a comprehensive and systematic process to verify that the building and all systems perform as designed to meet Owner requirements.

C. Commissioning Authority (CxA): The Owner’s designated representative(s) to plan, review, advise, witness, and evaluate the commissioning process of the Contractor.

D. Construction Checklist: A form used by the Contractor to verify that appropriate components are on site, ready for installation, correctly installed and functional.

E. Contractor's Commissioning Representative: (CCxR) The Contractor's designated individual to coordinate, manage, and execute the commissioning processes of the contracting organizations, and collaborate with the CxA.

F. Contractor's Commissioning Plan (CCxP): A plan that provides the structure, schedule and coordination planning for the commissioning process proposed specifically for this project. The CCxP includes Personnel (to be approved by the CxA), activities, and a description of the Infrastructure, and a list of all instruments and logging devices that will be used during Commissioning.

G. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents, does not perform properly or is not complying with the Basis of Design.

H. Functional Performance Test (FPT): Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., operation of new systems is tested for proper operation and integration with existing SCADA). Systems are tested under various modes, such as during low flows, high flows, low organic loading, high loading, component failures, unoccupied, varying outside air temperatures, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional performance testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The Commissioning Authority (CxA) develops the sequentially written functional test procedure forms, and oversees and documents the actual testing, which is performed by the installing Contractor or vendor. The CCxR creates worksheets from these forms which include procedures required to accommodate actual equipment, means and methods used in the project. Functional Performance Tests are performed after pre-functional checklists and startup is complete.

I. Manual Test: Using hand-held instruments, control system readouts or direct observation to verify performance (contrasted to analyzing electronically monitored data taken over time to make the "observation").

J. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

K. Pre-functional Checklist: A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Contractor. Pre-functional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels ok, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor). The word "pre-functional" refers to "before" functional testing. Pre-functional checklists augment and are combined with the equipment manufacturer's start-up checklist.

L. Seasonal Performance Tests: Functional Performance Tests that are deferred until the system(s) will experience seasonal conditions closer to their design conditions.

M. Systems Manual: A system focused composite document that includes the operational manual, maintenance manual, and additional information of use to the Owner during the Occupancy and Operation Phase.

1.3 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action.

1. CCxR, -The Contractor's Commissioning Representative. The CCxR shall be approved by the Engineer and satisfy as many of the following requirements as possible:
   a. Technical training in Mechanical and/or Electrical engineering
   b. Past commissioning experience.
   c. Knowledge of local and national codes.
   d. Specific experience with specialty systems relative to the particular facility type.

2. CQC Supervisor – Contractor's quality control supervisor
3. Other Representatives - May include Project superintendents, installers, suppliers, and specialists.

B. Members Appointed by Engineer:

1. CxA: The Commissioning Authority
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Perform commissioning tests, as required by the technical specifications with oversight and acceptance of CxA. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Record and resolve commissioning issues in cooperation with the CxA.
3. Attend commissioning team meetings held on a **variable** basis.
4. Integrate and coordinate commissioning process activities with the overall project schedule.
5. Review the Construction Checklist attached at the end of this specification section.
6. Complete **electronic** construction checklists as contract work is completed and provide to the Commissioning Authority.
7. Coordinate with the CxA in the review and acceptance of the commissioning process test procedures as described in the contract documents.

8. Complete commissioning process test procedures.
9. Provide maintenance orientation and inspection for systems, assemblies, equipment, and components based on contract requirements.
10. Provide Contractor's Commissioning Plan and documentation required by the CxA for final commissioning documentation.
11. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.5 COMMISSIONING DOCUMENTATION

A. Provide the following information:

1. Review of systems manual, submittals, documents, and other commissioning reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Contractor's Commissioning Plan including Process activities and schedule for completing construction checklists and manufacturer's pre-start and startup checklists for systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, pre-start checks, and startup procedures have been completed.
5. Certificate of readiness certifying that systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Testing, adjusting, and balancing reports.

1.6 SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, pre-start, and startup activities.

C. Contractor's Commissioning Representative Qualifications.

D. Contractor's Commissioning Plan: Submit within 30 calendar days of authorization to proceed.

1. Update as necessary during the work to reflect the progress on the components and systems.

E. Edited functional performance test forms: Submit minimum 30 calendar days prior to testing

F. Deficiency Report and Resolution Record: Document items of non-compliance in materials, installation or operation. Document the results from start-up/pre-functional checklists, functional performance testing, and short-term diagnostic monitoring. Include details of the components or systems found to be non-compliant with the drawings and specifications. Identify adjustments and alterations required to correct the system operation, and identify who is responsible for making the corrective changes.

1. Update as necessary during the work to reflect the progress on the components and systems. Submit updated versions monthly.

G. Closeout Documentation

1. Closeout documents for commissioned equipment and systems shall be submitted prior to the functional performance testing. These include, but are not necessarily limited to:

   a. Record Documents and Drawings
   b. Start-up certificates for all commissioned equipment with start-up requirements.
   c. Systems Operation and Maintenance Manual
   d. Include TAB, startup, and Control System check-out reports.
   e. Other documents required by Section 01 77 00.

2. O&M Submittals (refer to requirements of technical specifications):

   a. Training plan: Training plan shall include the following for each training session:

      1) Dates, start and finish times, and locations;
      2) Outline of the information to be presented;
      3) Names and qualifications of the presenters;
      4) List of texts and other materials required to support training.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. Instrumentation shall meet the following standards:

1. Be of sufficient quality and accuracy to test and measure system performance within the tolerances required to determine adequate performance.
2. Be calibrated on the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument being used.
3. Be maintained in good repair and operation condition throughout the duration of use on this project.

B. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Contractor for the equipment being tested.

C. All required commissioning equipment (sensors, transducers, data loggers, etc.) not integral to the systems or equipment installed will be provided by the Contractors Commissioning Representative, and shall not become the property of the Owner.

2.2 PRE-FUNCTIONAL CHECKLIST:

A. Pre-functional checklists shall consist of issues relevant to the construction of the commissioned item prior to the functional performance testing.

B. The pre-functional checklists shall be complementary to the Contractor's Commissioning Plan and Commissioning Schedule

2.3 FUNCTIONAL PERFORMANCE WORKSHEETS:

A. Functional Performance Test forms, provided in the contract documents, consist of the test procedures and expected results of the testing witnessed by the Commissioning Authority.

B. The Contractor shall review and coordinate the forms, customizing them to reflect project-specific worksheets, accounting for the Contractor's means, methods, and materials.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS

A. The following activities outline the general commissioning tasks (requiring development, execution, etc.) and order in which they occur. Specific Commissioning requirements are found in the technical specifications.

1. Commissioning Scoping Meeting.
2. Contractor's Commissioning Plan.
3. Start-Up/Pre-Functional Checklists.
4. Functional Performance Testing.
5. Deficiency Report and Resolution Record.
6. Operation and Maintenance Documentation.
7. Operations and Maintenance Training.
8. Deferred testing

3.2 TOTAL BUILDING COMMISSIONING REQUIREMENTS (TBC)

A. TBC during the construction, acceptance, and warranty phases is intended to achieve the following specific objectives:

1. Verify that equipment is what was submitted and approved.
2. Verify and document that equipment is installed and started per manufacturer's recommendations, industry accepted minimum standards, and the Contract Documents.
3. Verify and document that equipment and systems receive complete operational checkout by installing Contractors.
4. Verify and document equipment capacity and system efficiency.
5. Verify the performance of the treatment systems. Document testing and conformance to the Contract Documents.
6. Verify the completeness of operations and maintenance materials.
7. Ensure that the Owners operating personnel are adequately trained on the operation and maintenance of equipment.

3.3 COMMISSIONING SCOPING MEETING

A. Commissioning Scoping Meeting:

1. Schedule, coordinate, and facilitate a scoping meeting.
2. Review each building system and treatment process to be commissioned, including its intended operation, commissioning requirements, and completion and start-up schedules.
3. Establish the scope of work, tasks, schedules, deliverables, and responsibilities for implementation of the Contractor's Commissioning Plan.
4. Attendance: Commissioning Team members.

3.4 CONTRACTOR'S COMMISSIONING PLAN

A. Commissioning Plan: Develop a commissioning plan to identify how commissioning activities will be integrated into general construction and trade activities. The commissioning plan shall identify how commissioning responsibilities are distributed. The intent of this plan is to evoke questions, expose issues, and resolve issues with input from the entire commissioning team early in construction.

1. Identify who will be responsible for producing the various procedures, reports, Engineer notifications and forms.
2. Include the commissioning tasks and activities in the overall project schedule. Tag individual activities so they can be filtered at a later date.
3. List and describe each test/acceptance procedure.

3.5 START-UP/PRE-FUNCTIONAL CHECKLISTS

A. Start-Up/Pre-Functional Checklists: Complete pre-functional checklists prior to start up. Checklist shall help verify that the systems are complete and operational, so that the functional performance testing can be scheduled.

1. Verify equipment installed is what was approved on the Submittal.
2. Manufacturer's start-up checklists and other technical documentation guidelines may be used as the basis for pre-functional checklists.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. Functional Performance Testing: Test procedures shall fully describe system configuration and steps required for each test; procedures shall be appropriately documented so that another party can repeat the tests with virtually identical results.

1. Test Methods: Functional performance testing and verification may be achieved by direct manipulation of system inputs (i.e. flow meters and pressure transducers), manipulation of system inputs with the system automation (i.e. software override of sensor inputs), trend logs of system inputs and outputs using the treatment system automation, or short-term monitoring of system inputs and outputs using stand-alone data loggers. A combination of methods may be required to completely test the complete sequence of

operations. The Commissioning Authority shall determine which method or combination of methods is most appropriate.

2. Setup: Each test procedure shall be performed under conditions that simulate normal operating conditions as closely as possible. Where equipment requires integral safety devices to stop/prevent equipment operation unless minimum safety standards or conditions are met, functional performance test procedures shall demonstrate the actual performance of safety shutoffs in real or closely-simulated conditions of failure.
3. Sampling: Multiple identical pieces of non-life-safety or non-critical equipment may be functionally tested using a sampling strategy. If, after three attempts at testing the specified sample percentage, failures are still present, then all remaining units shall be tested at the Contractors' expense.

B. Customize functional performance test procedure forms (in the technical specifications) to accommodate actual installed equipment and systems.

C. Coordinate, execute and record the results of the functional performance testing.

1. Coordinate retesting as necessary until satisfactory performance is verified.
2. Verify the intended operation of individual components and system interactions under various conditions and modes of operation.

3.7 DEFICIENCY REPORT AND RESOLUTION RECORD

A. Deficiency Report and Resolution Record: Document items of non-compliance in materials, installation or operation.

B. Non-Conformance. Non-conformance and deficiencies observed shall be addressed immediately. Notify responsible parties and provide recommended actions to correct deficiencies.

1. Corrections of minor deficiencies identified may be made during the tests at the discretion of the Commissioning Authority. In such cases the deficiency and resolution shall be documented on the procedure form.
2. For identified deficiencies:

    a. If there is no dispute on the deficiency and the responsibility to correct it:

        1) The CxA documents the deficiency and the adjustments or alterations required to correct it. The Contractor corrects the deficiency and notifies the CxA that the equipment is ready to be retested.
        2) The CCxR reschedules the test and the test is repeated until satisfactory performance is achieved.

    b. If there is a dispute about a deficiency or who is responsible:

        1) The deficiency is documented by the CxA on the non-compliance form and a copy given to the CCxR.
        2) Resolutions are made at the lowest management level possible. Additional parties are brought into the discussions as needed. Contractor shall have responsibility for resolving construction deficiencies. If a design revision is

deemed necessary and approved by the Engineer, Architect/Engineer shall have responsibility for providing design revision. The Commissioning Authority documents the resolution process.

3) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the CxA that the equipment is ready to be retested. The CCxR reschedules the test and the test is repeated until satisfactory performance is achieved.

3. Cost of Retesting: Costs for retesting shall be charged to the Contractor.

3.8 OPERATIONS AND MAINTENANCE TRAINING

A. Training: Develop a Training Plan. Coordinate and execute the training programs with the CxA.

1. Stress and enhance the importance of system interactions, troubleshooting, and long-term preventive maintenance and operation programs.

3.9 DEFERRED TESTING

A. Unforeseen Deferred Tests: If a test cannot be completed due to the building structure, required occupancy condition, or other deficiency, the functional testing may be delayed upon recommendation of the CxA and the approval of the Engineer. These tests are conducted in the same manner as the seasonal tests, as soon as possible.

B. Seasonal Testing;

1. Schedule, coordinate, execute, and document additional testing for seasonal variation in operations and control strategies during the appropriate season to verify performance of the system and controls. Complete testing during the warranty period to fully test all sequences of operation.
2. Update O&M manuals and Project Record Drawings as necessary due to the testing.

3.10 EQUIPMENT & SYSTEM SCHEDULE

A. Commissioned Equipment and Systems List: The following is a list of systems and equipment to be commissioned organized by system. It also includes the percentage of each category that will undergo testing. The intent is to provide an overall summary of commissioned equipment and systems, and not a comprehensive list. Refer to applicable specification sections for more information.

COMMISSIONED EQUIPMENT AND SYSTEMS LIST			
SYSTEM	**EQUIPMENT**	**CC**	**FPT**
Well 9 & 10			
	Variable Frequency Drive	X	X
	Pump & Motor	X	X
	SCADA & Controls (Pressure Transducers, Meter)	X	X
Orthophosphate Treatment System			
	Meter Pump – Variable Speed Control	X	X
	Solenoid Valve	X	X
	Conditioned Water Booster Pump (Well 9 chemical feed)	X	X
	SCADA & Alarms	X	X
Chlorine Gas Disinfection System			
	Chlorine Injection System – Variable Feed Control	X	X
	Chlorine Detector	X	X
	Building Lighting & HVAC	X	X
	Conditioned Water Booster Pump (Well 9 chemical feed)	X	X
	SCADA & Alarms	X	X
Generator	Genset Startup & Commissioning	X	X
	Generator Room HVAC	X	X
	Transfer Switch	X	X
	SCADA & Alarms	X	X
Pump House Building	Building Lighting & HVAC	X	X
	Garage Door	X	X
	Access & Security Control System	X	X
	ToJ SCADA System	X	X

END OF SECTION 01 91 14

CLOSEOUT AND OPERATION & MAINTENANCE REQUIREMENTS					
Topic	**Specification Section**	**Requirement**	**Submittal Date**	**Completed**	**Received by Engineer**
Project Record Drawings	01 73 40	Existing Buried Utilities			
	01 77 00	Project Record Drawings			
	03 30 00	Cast-in-place concrete record drawings			
	22 00 00	Plumbing piping, ducts & equipment			
	23 00 00	HVAC			
	26 00 00	Electrical			
	25 51 00	Instrumentation record drawings, PID			
	31 10 00	Capped and Abandoned Utilities			
	32 80 00	Irrigation Systems			
	33 11 13	Buried Water Main & Services			
System Demonstration and Training	01 79 00	Demonstration and Training Videos			
	23 00 00	HVAC Systems			
	23 81 26	Air Conditioning			
	25 30 00	Process Instrumentation			
	25 51 00	System Instrumentation and programming / SCADA			
	Div 26	Electrical Equipment			
	26 29 23	Variable Frequency Drives			
	32 80 00	Irrigation Systems			
	33 21 13	Well Operations			
	40 94 33	SCADA Training, controls, PLCs, etc.			
	46 31 11	Chlorine Gas and Alarm System			
	46 33 44	Phosphate Metering Pumps			
Tools Spare Parts Equipment	25 30 00	Control Panels: bulbs, fuses, pilot lights, step-down transformers			
	25 30 00	Tools: Fuse puller			
	26 00 00	Electrical - Fuses, Pilot Lights & Covers etc.			
	26 29 23	VFD: Main board, operator panel, inverter module & fuses			
	40 94 33	SCADA: Spare Fuses			
	46 31 00	Emergency Repair Kit for 150 lb gas cyclinder & Gas Mask			
Reports	01 33 23	Manufacture's Field Reports			
	01 91 14	Commissioning Reports			
	23 00 00	Testing, Adjusting and Balancing HVAC Reports			
	25 30 00	Instrumentation Calibration Records			
	26 00 00	Electrical Test Reports			
	26 29 23	VFD: Manufacturer's Field Reports			
	33 11 13	Field Hydrostatic Pressure Tests for Pipelines			
	33 13 00	Water Distribution: Bacti Tests			
	33 21 13	Well Pump Testing			
	40 94 33	SCADA I/O and Startup Reports			
	46 31 11	Chlorine Gas System			
Keys and keying schedule					
	Division 08	Doors			

CLOSEOUT AND OPERATION & MAINTENANCE REQUIREMENTS					
Topic	**Specification Section**	**Requirement**	**Submittal Date**	**Completed**	**Received by Engineer**
Warranties	07 13 53	EPDM Roof Membrane: Mfg. & Installers Warranty			
	07 41 13.16	Metal Roofing: Mfg. & Installers Warranty			
	08 33 23	Overhead Coiling Door: O&M Manual & Warranty			
	23 00 00	HVAC Controls: O&M Manual & Warranty			
	23 34 23	HVAC Power Ventilators: O&M Manuals & Warranties			
	23 82 39.19	Heaters: O&M Manuals & Warranties			
	25 30 00	Control System Equipment: O&M Manuals & Warranties			
	25 51 00	O&M Manuals & Warranties: System SCADA; Manuals shall be custom written according to the operation and control logic of the facility			
	Division 26	O&M Manuals, warranties for electrical equipment.			
	26 29 23	VFD: O&M Manuals & Warranties			
	32 80 00	Landscape Irrigation: O&M Manuals & Warranty			
	32 92 23	Sod: Warranty			
	32 93 00	Plantings: Warranty			
	33 21 13	Well Pump & Motor			
	40 94 33	System SCADA: O&Ms Manual & Warranty			
	46 31 11	Chlorine Gas System: O&Ms Manual & Warranty			
	46 33 44	Peristaltic Metering Pjump			

SECTION 01 95 00 - FORCE ACCOUNT WORK

PART 1 GENERAL

1.1 SUMMARY

A. This section consists of the supply of labor, materials, equipment, and supplies necessary to perform special work items which are clearly outside the scope of the project requirements that which are authorized by the Owner and Engineer. Payment for accomplishing these items will be made on a time-and-materials basis, or other agreed upon lump sum price mutually agreed upon by Contractor, Owner and Engineer.

B. Work changes and associated costs resulting in a change to the Contract price that are not applied to "Force Account" shall be made in accordance with Article 11, and other applicable parts of the project General Conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 ADMINISTRATIVE MATTERS

A. In general, items included in the category of Force Account Work, include the following:

1. Unforeseen utilities or obstructions that conflict with construction resulting in additional cost.

2. Changes in materials or equipment resulting in more expense to Contractor.

3. Unforeseen subsurface conditions resulting in a change in design.

B. It shall be understood that any extra work shall only be done at the direction and approval of the Engineer/Owner and shall be mutually agreed upon to be extra work prior to any extra work being done.

C. Force account work will be documented on forms provided by the Contractor and reviewed by the Engineer.

D. Determination of Time-and-Material Cost:

1. Each bidder shall supply as part of his bid, an hourly rate sheet covering all equipment and personnel within his organization. Both labor and equipment hourly rates shall include Contractor's overhead and profit and hourly rates for equipment shall include the operator. The hourly rate sheet of the successful bidder will establish personnel and equipment force account rates for the extent of the project.

2. Where work is performed by subcontractors, Contractor shall provide hourly rate sheets for subcontractor's labor and equipment for Engineer/Owner review, consistent with requirements under 3.1/B/1 above. Contractor shall be afforded a 5% markup on subcontractor's final costs to perform the work.

3. Materials and supplies required under Force Account Work will be paid at 15% above invoice costs. Invoices must be supplied to support material costs.

4. No Force Account Work will be paid at overtime labor rates.

5. It is assumed that Force Account Work will require equipment and personnel already onsite, therefore mobilization and demobilization costs will not be paid.

E. The means by which Force Account Work is accomplished will be determined in advance and must be authorized in advance by the Engineer and Owner.

F. Work billed under this item shall be clearly and concisely itemized. Time tickets and material receipts shall accompany all requests for payment under this item. Force Account Work shall be reconciled with time sheets and material invoices between the Contractor and the Engineer daily to ensure proper accounting.

PART 4 METHOD OF MEASUREMENT AND BASIS OF PAYMENT

4.1 METHOD OF MEASUREMENT

A. For measurement of "Force Account" See Section 01 27 00 – Measurement and Payment Procedures

4.2 BASIS OF PAYMENT

A. For payment for "Force Account" see Section 01 27 00 – Measurement and Payment Procedures

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes Cast-in-place concrete; including formwork, form accessories, form stripping & openings for other work, reinforcing steel & accessories, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. HSR Pump House:
    a. Footings & Foundation Slabs
    b. Exterior Foundation
    c. Cast In Place Slabs
    d. Exterior Slabs-on-grade

B. Related Sections:
1. Section 01 33 23 – Submittal Procedures
2. Section 03 37 00 – Concrete Curing
3. Section 03 41 00 - Precast Structural Concrete.
4. Section 03 60 00 – Grouting
5. Section 05 12 00 – Structural Steel Framing
6. Section 05 50 00 – Metal Fabrications
7. Section 05 50 10 – Anchor Bolts and Expansion Anchors
8. Section 40 05 13 – Common Work Results for Process Piping [Pipe wall sleeves & wall penetrations]

1.3 REFERENCES

A. American Concrete Institute:
1. ACI 117 – Standard Tolerances for Concrete Construction and Materials
2. ACI 211.1 – Selecting Proportions for Normal, Heavyweight, and Mass Concrete
3. ACI 214 – Recommended Practice for Evaluation of Strength Test Results of Concrete
4. ACI 301 - Specifications for Structural Concrete for Buildings
5. ACI 302.1R – Guide for Concrete Floor and Slab Construction
6. ACI 304 – Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
7. ACI 305 - Hot Weather Concreting.
8. ACI 306.1 - Standard Specification for Cold Weather Concreting.
9. ACI 308.1 - Standard Specification for Curing Concrete.

10. ACI 309 – Guide for Consolidation of Concrete
11. ACI 315 – Details and Detailing of Concrete Reinforcement
12. ACI 318 - Building Code Requirements for Structural Concrete.
13. ACI 347 – Guide to Formwork for Concrete
14. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures
15. ACI SP-66 – American Concrete Institute Detailing Manual

B. ASTM International:
1. ASTM A615/A615M – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
2. ASTM A1064/A1064M – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
3. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
4. ASTM C33 - Standard Specification for Concrete Aggregates.
5. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
6. ASTM C42/C42M - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
7. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
8. ASTM C127 – Standard Test Method for Specific Gravity and Absorption of Course Aggregate.
9. ASTM C128 – Standard Test Method for Specific Gravity and Absorption of Fine Aggregate.
10. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic Cement Concrete.
11. ASTM C150 - Standard Specification for Portland Cement.
12. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
13. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
14. ASTM C192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
15. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
16. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
17. ASTM C330 - Standard Specification for Lightweight Aggregates for Structural Concrete.
18. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
19. ASTM C595 - Standard Specification for Blended Hydraulic Cements.
20. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
21. ASTM C685/C685M - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
22. ASTM C845 - Standard Specification for Expansive Hydraulic Cement.
23. ASTM C989 - Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.
24. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
25. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
26. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures.
27. ASTM C1260 – Test Method for Potential Alkali Reactivity of Aggregates.

28. ASTM C1567 – Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate.
29. ASTM D395 – Test Methods for Rubber Property – Compression set.
30. ASTM D412 – Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomer – Tension.
31. ASTM D624 – Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomer.
32. ASTM D746 – Test Method for Brittleness Temperature of Plastics by Impact.
33. ASTM D792 – Test Method for Specific Gravity (Gravity Density) and Density of Plastics by Displacement.
34. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
35. ASTM D1190 – Concrete Joint Sealer, Hot-Poured Elastic Type.
36. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
37. ASTM D1752 - Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
38. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
39. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.
40. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
41. CRSI – Concrete Reinforcing Steel Institute – Manual of Standard Practice.
42. CRSI – Placing Reinforcing Bars, 8th edition.

1.4 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.5 PERFORMANCE TOLERANCES

A. Cast in Place concrete shall conform to ACI 307R and ACI 347, as modified herein. In case of conflict, ACI 347 governs.

1.6 SUBMITTALS

A. Section 01 33 23 – Submittal Procedures.

B. Product Data: Submit data on joint devices, attachment accessories, admixtures, concrete mix designs; and all items pertaining to cast-in-place concrete.

C. Concrete Formwork & form accessories Submittals & Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Provide formwork product literature including formwork type, construction, and system. Design calculations for the formwork and system must be submitted.
2. Formwork drawings & details, and erection drawings identifying all requirements for the formwork system must be submitted.
3. Design calculations for the formwork must include the allowable and approved pour pressure and pour rate.
4. Form tie system and grouting procedures for grouting form tie holes.

D. Steel Reinforcement Shop Drawings: Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

1. Submit Shop drawings for fabrication, bending and placement of concrete reinforcement.
2. Include material lists, material designations, bend types and details, lap splice lengths, placement drawings, and manufacturer's literature for any securing materials.
3. Shop Drawings must be clear and easy to review. Wall elevation and slab plan view showing reinforcing layouts; in addition to wall and slab sections and details shall be provided.
4. Comply with ACI 315, showing bar sizes, schedules, openings, spacing's, locations, bent bar diagrams, and quantities of reinforcing steel and wire fabric.
5. Shop Drawings shall indicate bar sizes; spacing's; locations; and quantities of reinforcing steel, as well as bending and cutting schedules, and supporting and spacing devices.
6. Include pertinent dimensions, materials, bracing, and arrangement of joints and ties.

E. Waterstops for Concrete Joints – Submittals and Product Data:

1. Submit product samples and manufacturers literature.
2. Manufacturer's product data sheets including physical properties.
3. Manufacturer's installation instructions and splicing instructions & details.
4. Sample of shop fabricated "T" Section.
5. Detail/Approval from Manufacturer for Retrofit to Ribbed Centerbulb connections -OR- alternative detail at Manufacture's recommendation.
6. Submit manufacturer's standard warranty.

F. Concrete Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Submit Concrete mix design for each strength of concrete specified. Submit separate mix designs when admixtures are required for Hot and cold weather concrete work and air entrained concrete work.
2. Submit Concrete mixture proportions and characteristics of proposed mix design along with test data identifying compression strength at 7 day and 28 day testing.
3. Mix design to include proposed admixtures to provide workability; prevention of rapid drying; and improved finishing capabilities' for the contractor to achieve acceptable placement, finishing and consolidation; with concrete mix requirements of Low Water Cement Ratio and low slump.
4. Mix design and admixtures must have the minimum strength and properties required.

5. Proportions of materials for concrete shall be established to provide workability and consistency to permit concrete to be worked readily into forms and around reinforcement under conditions of placement to be employed, without segregation or excessive bleeding.
6. Concrete Mix Design & Laboratory Test reports to include:
    a. Slump Range on which the design is based.
    b. Total gallons of water per cubic yard.
    c. Brand, type, composition and quantity of fly ash (if used)
    d. Specific gravity and gradation of each aggregate.
    e. Ratio of fine to total aggregates.
    f. Surface-dry weight of each aggregate per cubic yard.
    g. Brand, type, ASTM designation, and active chemical ingredients and quantity of each admixture.
    h. Air content and tolerance.
    i. Water/Cementitious material ratio and tolerance.
    j. Compressive strength based on 7 day and 28 day compression tests in accordance with ASTM C39.
    k. Submit supplier certified fly ash test reports for each shipment delivered to concrete supplier.
    l. Signed by contractor and concrete supplier.

G. Concrete Mix Test Results:

1. Submit ASTM C1260 or ASTM C1567 test results for aggregates used; & ASTM C618 test results if fly ash is to be used.
2. Test results to be submitted for approval a minimum of 30 days prior to intended concrete placement.
    a. In the event the mix design and/or test results are not acceptable and additional ASTM testing is required, additional time will be needed for the contractor to get an approved mix design and the appropriate test results obtained.
3. ASTM C1260 (Test for Potential Alkali Reactivity of Aggregates) Laboratory Test Results.
4. ASTM C1567 – (Test for Determining the Potential Alkali Silica Reactivity of Combinations of Cementitious Materials and Aggregate) laboratory test results if reactivity mitigation is required by ASTM C1260 test results.
5. ASTM C618 – Fly Ash Test Results, as indicated in the section below.

H. Concrete Mix Admixtures:

1. If Fly Ash is used in the Concrete Mix design, it must conform to ASTM C618 and meet all the requirements. ASTM C618 test results must be submitted for review. *Fly Ash used must be in compliance with ASTM C618-97, and the "Supplementary Optional Chemical Requirement" must be provided.
    a. Fly Ash sources used must be approved per ASTM C618-97 and/or per the WYDOT Materials Testing Manual – "Approved Fly Ash Sources for Mitigation". Fly Ash not included on that list; or not meeting Table 1A of ASTM C618-97, WILL NOT BE ALLOWED.

I. Concrete Mix Product Data:

1. Provide product data on all admixtures and components of the mix design.

a. Hot and cold weather concrete work.
b. Air entrained concrete work.

2. Identify mix ingredients and proportions, including admixtures.
3. Indicate amounts of mixing water to be withheld for later addition at Project site.

J. Construction Joint Layout: The Contractor shall submit a Drawing indicating the location of all construction joints to the Engineer and Structural Engineer of record for approval prior to concrete placement.

K. Concrete Delivery:

1. The Contractor shall submit for approval, a plan for the uninterrupted delivery, placement, and curing procedures to be used for each pour between construction joints; at least 14 days prior to anticipated placement.
2. The Concrete Delivery Plan shall include alternatives for delivery and placement procedures, in the event of unforeseen mechanical malfunctions or other delays.
3. Backup supply sources and placement equipment should be available for use within 30 minutes in the event of primary supply or equipment breakdown.
4. The Delivery Plan shall also include a plan to keep concrete in acceptable condition during delivery time. Timing of successive delivery trucks, and course of action if one truck is delayed on delivery or delayed on placement, shall be provided along with the effects on additional deliveries.
5. The Delivery Plan and placement plan must include anticipated delivery and placement schedule to ensure that cold joints will not occur in the wall or slab/floor pours of the each foundation system, that are not identified on the project drawings.
6. The Contractor must coordinate with the concrete mix provider to develop a plan of action if the concrete mix arrives on site and is out of specification for air content; slump; or water cement ratio, or if the concrete mix is not of consistency to permit workability and placement without segregation or excessive bleeding.
    a. If the concrete mix is out of specification and the specification requirements cannot be achieved on site; the concrete will be rejected and not allowed to be placed.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Formwork Supplier; & Rebar certifications.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Semi rigid joint filler.
11. Joint-filler strips.
12. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

D. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

E. Field quality-control reports.

F. Minutes of pre-installation conference.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: A agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Pre-installation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.

e. Special concrete finish subcontractor.

G. The Owner will employ a testing laboratory to perform tests and to submit test reports.

H. Sampling and testing for quality control during placement of concrete shall be as indicated in Section 3 of this specification, and as directed by the Engineer. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C97.

I. Acquire cement and aggregate from same source for all Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Store off the ground on platforms, skids, or other supports that will keep it from contract with the ground and cover to prevent unacceptable surface corrosion and contamination. Protect from oil, dirt, detrimental scale, paint, mechanical injury, and other deleterious materials.

1. All loose rust and mill scale must be removed from reinforcing steel prior to placement, with a wire brush. All reinforcing steel shall be inspected prior to placement in concrete.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

C. Cement and Fly Ash: Store in moisture proof enclosures, do not use if caked or lumpy.

D. Aggregate: Store to prevent segregation and inclusion of foreign materials, do not use the bottom 6 inch of piles in contact with the ground.

E. Rubber and Plastic Materials: Store in a cool place off the ground and protected from moisture, dirt, oil, other contaminants, and do not expose to direct sunlight.

F. Protect all materials from damage during handling and installation in accordance with the manufacturer's instructions.

G. Prepare a delivery ticket for each load of ready-mixed concrete. Truck operator shall hand the ticket to the Contractor at time of delivery and the ticket to show:

1. Quantity delivered
2. Actual quantity of each material in batch
3. Outdoor temperature in the shade
4. Time at which cement was added
5. Numerical sequence of the delivery
6. Quantity of water that can be added in the field based on the approved mix design
   a. The Contractor must verify the quantity of water that can be added in the field after calculating the water cement ratio from the batch plant; and the water cement ratio with the addition of said quantity of water – before any water is added in the field.
   b. The Contractor must be able to determine the water cement ratio of the mix from the quantities shown on the ticket, and the water cement ratio will be determined and verified for each truck prior to placement.
7. Free moisture in fine and coarse aggregate in percent by weight.

8. Temperature of batch.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Forms shall be matched, tight fitting, and stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Design formwork and shoring to carry all loads transmitted to them and to comply with the requirements of the applicable building code. Design formwork to withstand the pressure resulting from placement and vibration of concrete and to maintain specified tolerances.

D. Maximum deflection of facing materials reflected on concrete surfaces exposed to public view shall be: *length of the span/240* between structural members of the formwork.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
   a. High-density overlay, Class 1 or better.
   b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
   c. Structural 1, B-B or better; mill oiled and edge sealed.
   d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

E. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

F. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

G. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

H. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

I. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

J. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal or other material except concrete within 1 ½ inch of the formed concrete surface.
2. Furnish ties that, when removed, will leave cone shaped holes no larger than 1 inch in diameter, and 1 ½ inches deep in concrete surface to allow filling and patching.
3. When a portion of single rod ties are to remain, there should be tightly fitted washer at the midpoint.
4. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
5. Form tie assemblies and systems in liquid-containment structures shall be suitable for providing a liquid tight structure.

K. Formwork Engineering, Construction, Shoring, Bracing, & Removal shall conform to ACI 301 & ACI 347 code requirements. All components and members of the structure shall be cast to the correct dimensions, shape, alignment, elevation, and position as indicated on the drawings and without deflection.

L. Forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the Construction documents.

1. Vertical deviation from plumb is not to exceed ¾" at the height of the structure. Overall dimensions must not deviate from specified dimension greater than 1 ½" at any point checked around the perimeter of the foundation wall system.

2.2 STEEL REINFORCEMENT

A. Reinforcing Steel Bars: ASTM A 615/A 615M, Grade 60; 60 ksi yield strength, deformed bars, uncoated free of deleterious materials.

B. Welded Wire Fabric: ASTM A1064, Plain Type, unfinished

C. Tie Wire: 16.5 gage or heavier, black annealed wire.

D. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, zinc coated after fabrication and bending. Where indicated on the Project Drawings.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
3. Bar Supports: PS 7; CRSI Class B or E, fabricated from galvanized wire having PVC coated legs.
4. Chairs, Bolsters, Bar Supports, and Spacers are to be sized and shaped for strength and support of reinforcement during concrete placement conditions.
5. Zee bars (or High Chairs, with proper height) are required between top and bottom rebar mats in the foundation slab, along with chairs required below the bottom matt.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type II. Where aggregates are alkali reactive, a low-alkali cement having a maximum alkali content of 0.60% Na_2O equivalent shall be used.

a. Fly Ash: ASTM C 618, Class F or C, except loss on ignition not more than 5%, & Available Alkalies (as Na_2O) less than max % allowed.
1) Fly Ash used in the mix design or for mitigation must be in compliance with ASTM C618-97 with "Supplementary Optional Chemical Requirements" provided, and the Available Alkalies as equivalent as Na_2O% must be below the maximum % indicated in ASTM C618-98, or the Fly Ash will be rejected.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Fine Aggregate: Clean, natural sand, ASTM C33; no manufactured or artificial sand. Free of materials with deleterious reactivity to alkali in cement.

D. Coarse Aggregate: Crushed rock, natural gravel, or other inert granular material graded, ASTM C33 except clay and shale particles no more than 1%. Free of all materials deleteriously reactive with alkalies in the cement in an amount to cause excessive expansion of concrete. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.

E. All Coarse and Fine Aggregates shall be tested for Alkali-Silica Reactivity (ASR) according to ASTM C1260 tests. Aggregate sources which exhibit ASTM C1260 mean mortar expansion greater than 0.10% at 14-days shall be considered potentially reactive and shall require mitigation. Mitigative additives may be approved fly ash, lithium nitrates, or other additives in any combination. The proposed mix design with Mitigative additions shall be tested according to ASTM C1567.

F. Water: ASTM C 94/C 94M, potable.

1. Water to be Clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or steel.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Admixtures including Accelerators – High range water reducer; Retarders; and Plasticizers shall all be included in the concrete mix design for review and approval.

D. All admixtures must be accepted in writing by the Engineer.

2.6 FLEXIBLE THERMOPLASTIC VULCANIZATE (TPV) WATERSTOPS:

A. Flexible Thermoplastic Vulcanizate (TPV) Waterstops: Ribbed Center Bulb Waterstop & Retrofit Waterstop, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints.

1. Factory fabricate corners, intersections, and directional changes.
2. Install Thermoplastic Vulcanizate (TPV) Waterstops at all construction joints.
   a. Ribbed Center Bulb Waterstop:
      1) Profile: Ribbed with center bulb
      2) Dimensions: 6 inches by 3/16 (min) inch thick – nontapered.
   b. Retrofit Waterstop:
      1) Profile: Retrofit Tee type waterstop with centerbulb at bottom of web.
      2) Dimensions: 3 inch web 3/16 (min) to match Ribbed centerbulb. 4½” flange, with batten bars to attach to existing concrete system.

B. Ribbed Center Bulb Waterstop to be: (Or approved equal)

1. JP Specialties Inc.:
   a. 6” Ribbed Center Bulb Waterstop. Part Number EY JP636, with factory installed brass eyelets (grommets) in outermost rib. Shop manufactured “T” fittings are to be utilized at all intersections.

   b. Tee Type Retrofit Waterstop, with 3” web leg & centerbulb to match half profile of Retrofit Waterstop. Part Number EY JP450T, with factory installed eyelets (grommets) & with Stainless steel batten bars and anchors for application to existing concrete system.

2. Or Equal

C. Accessories: Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for field welding.

D. Manufacturer to provide factory made details or approval/instructions for coordination with retrofit corners; and retrofit to centerbulb connection. Manufacturer can provide alternative details for EOR to review in submittal / shop drawings if appropriate for field conditions.

E. Provide factory installed grommets/eyelets spaced at 12 inches on center (maximum) along the length of the waterstop in the outermost rib, for attachment to the reinforcing steel.

F. Provide Teflon coated thermostatically controlled waterstop splicing irons for field butt splices.

G. Ribbed Center Bulb Waterstops shall be used at ALL **NEW** Horizontal and Vertical cold joints. Horizontal cold joints which include the joint between foundation slab and walls; and Vertical cold joints between interior walls, and between interior and exterior walls.

H. Tee Type Retrofit Waterstops shall be used at all Existing to New Horizontal and Vertical cold joints. Horizontal cold joints which include joint between foundation slabs (existing to new); and Vertical cold joints include between existing and new wall pours.

1. No Horizontal or Vertical Cold joint shall be provided unless noted on the Project Drawings, or approved by the Engineer.
2. If Cold joints not shown on drawings - between interior wall sections; and joints between the interior walls and exterior perimeter wall are requested by the Contractor – these joints will be reviewed and approved by the Engineer.
3. Exterior walls should be placed in one continuous pour as shown on the drawings and as able.

2.7 HYDROPHILIC WATERSTOPS:

A. Swellable (hydrophilic) Strip Waterstops: Embedded continuously along concrete non-moving construction joints creating a continuous barrier to water migration.

B. Hydrophilic Waterstops can be used at upper level joints; Lime feeder building; concrete topping over hollow core tee beams; shallow foundation wall systems; etc.

C. Application of primer adhesive, as required for installation of hydrophilic waterstops.

D. Provide product data to substrate compliance with specifications.

E. Certification to hydrostatic pressure resistance of not less than 100 psi.

F. Hydrophilic waterstop to be a swellable strip waterstop:

1. Composed of butyl rubber and mastic
2. One inch by ¾ inch provided in a roll.

G. Waterstops shall be certified for use in drinking water containment structures per NSF/ANSI 61 Standard, or approved otherwise by the Engineer.

H. Hydrophlic Waterstop to be one of the following:

1. JP Specialties Inc/Earth Shield:
   a. “Type 20” 1”x3/4” x 16’-8” roll

2. Or Equal

I. Accessories:
   1. Adhesive: Provide the suitable adhesive for the waterstop manufacturer used. Adhesive to be solvent-based, for securing waterstop to horizontal and vertical substrates.
   2. Concrete cut nails to securing waterstop to joint faces.

2.8 FLOOR AND SLAB TREATMENTS

A. Exposed Slabs to have a Steel Troweled surface scheduled to be exposed – or - sealed with a Hardener/ Dust proofer. Texture interior floors and exterior slabs with non-slip broom finish in accordance with ACI 302.1R – “Class 1” Floors. These areas include:
   1. Topping slabs
   2. Clarifier Interior Slab on Grade
   3. Equipment Shed Slab on Grade
   4. Exposed Exterior Slabs on Grade

B. Lower Foundation Slabs in the interior water containment structures to have a float finished surface. LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

   1. Manufacturers:
      a. Sonneborm/ChemRex – Lapidolith
      b. Dayton Superior – Pentra Hard
      c. Chem Masters
      d. Kaufman Products Inc. Silane Seal
      e. Or Approved Equal

2.10 CURING MATERIALS

A. Cure concrete surfaces to requirements of Specification Section 03 37 00 – Concrete Curing.

B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd when dry.

D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

E. Water: Potable.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating**,** certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 175, asphalt-saturated cellulosic fiber.

B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.12 ACCESSORIES

A. Provide formed openings where required for items to be embedded in, and passing through concrete work, including but not limited to pipe sleeves; pipe openings; floor hatches; electrical conduits; & mechanical chases.

B. Locate and set in place items which will be cast directly into concrete, including but not limited to stainless steel plates and angles as necessary for roof support systems, or precast floor beam connections.

C. Coordinate with work of other sections in forming and placing openings, waterstops, bolts, anchors, steel plates and angles, pipe sleeves, other inserts and components of other work.

D. Coordinate with Specification Section 03 37 00 for curing concrete.

2.13 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4500 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.14 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, and silica fume as acceptable for the concrete mix design requirements. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Combined Fly Ash and Pozzolan: 25 percent.
3. Silica Fume: 10 percent.
4. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.15 CONCRETE MIXTURES FOR MISCELLANEOUS ELEMENTS – Storage Shed Foundations & Miscellaneous Concrete. [NOT INCLUDED IN THE WASTE WATER TREATMENT PLANT]

A. Footings; Foundation Walls; & Slabs on Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days (2,680 psi at 7 days).
2. Maximum Water-Cementitious Materials Ratio: 0.5.
3. Minimum Cementitious Materials Content: 564 lb/cu yard (6 bag mix)
4. Slump Limit: 4 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
5. Air Content: 5 percent, plus or minus 1.5 percent at point of delivery for foundation walls and footings; 6 percent, plus or minus 1 percent for exterior slabs; 3 percent for interior slabs.
   a. Do not allow air content of trowel-finish floors to exceed 3 percent.
2.

2.17 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement accurately to the dimensions shown on the drawings and in accordance with the CRSI "Manual of Standard Practice" or the ACI Detailing Manual.

B. Reinforcing bars shall be bent cold using appropriate bending tools, and should not be bent in a manner that will injure the material. Any bend is limited to an interior angle of 90 degrees or greater. Bending tools for #3 - #8 bars shall have a diameter of 6x bar diameter.

C. Field cutting of coated reinforcement should be performed using hydraulic-powered or friction cutting tools to minimize coating damage and field touch up. Flame cutting of coated reinforcement will not be permitted. Field cut coated reinforcement shall be repaired immediately with compatible patching material and suitable for repairs in the field.

D. Locate reinforcing splices not indicated on the drawings, at point of minimum stress. Review location of splices with Engineer.

E. Reinforcement splices in horizontal mats must be offset by a minimum of 36 inches, unless noted otherwise on the project drawings. Stagger the splice above and below, or (left and right) each side of the center bar. Splices shall not coincide in vertical or horizontal arrays more frequently than every third bar.

2.18 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd, increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

2.19 SOURCE QUALITY CONTROL

A. Test the proposed concrete mix for each size and gradation of aggregates and each consistency intended for use in the project.

B. Aggregates: Sample and test according to ASTM C33. Determine bulk specific gravity in accordance with ASTM C127 & ASTM C128.

PART 3 - EXECUTION

3.1 FORMWORK - GENERAL

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. 1/8 inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer corners and edges of permanently exposed concrete where indicated on the Project Drawings.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

M. Coordinate the formwork placement with waterstops and wall sleeves as required per the Contract Documents. Coordinate all steel inserts and imbedded times with formwork erection.

N. Forms shall result in a final structure that conforms to shapes, lines, and dimensions of the members as required by the Construction documents.
   1. Vertical deviation from plumb is not to exceed ¾” at the height of the structure. Overall dimensions must not deviate from specified dimensions greater than 1 ½” at any point checked around the perimeter of the foundation.
   2. If deviation of the specified dimensions exceeds the above tolerances after the formwork is in place; Prior to the placement of concrete – the Engineer must be notified and the tolerance must be approved – or changes to the formwork made.

O. Formwork Design must produce hardened concrete to the shape, lines, and dimensions indicated on the drawings. Place formwork with specified cover over reinforcement as indicated on the drawings and in accordance with ACI 318 & ACI 350.

P. Erect, Shore, and Brace formwork to achieve design requirements in accordance with ACI 347 – as modified herein.

Q. Removal of formwork shall leave an Architectural Finish on the exterior and interior surface, without fins.

R. Brace or tie forms to maintain desired position, shape, and alignment during and after concrete placement.

S. At form tie locations; the form tie holes shall be thoroughly cleaned, dampened, and grouted solid with nonmetallic non-shrinking grout, immediately after the form removal. The tie holes shall be

filled and packed solid by rodding. The grout material and procedure shall be approved by the Engineer prior to starting work.

T. Provide chamfer strips to bevel salient edges and corners, as indicated on the project drawings.

U. Do not remove or disturb until concrete has attained sufficient strength to safely support all dead and live loads.

V. Maintain forms in place for a minimum of 40 hours for length of curing time in accordance with ACI 306/306R when temperature is 45 degrees Fahrenheit and below.

W. Remove forms carefully to prevent surface gouging, corner or edge breakage and other damage.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

B. Accurately position and securely anchor in forms: anchor bolts; formed openings; pipe wall sleeves; reinforcement; waterstops; steel plates and angles (if required); and other anchorages and materials to be embedded in concrete as shown on the Project Drawings.

C. Cast In Place Anchor Bolts:
1. Unless installed in pipe sleeves, provide sufficient threads on anchor bolts to permit a nut on the concrete side of the form or template.
2. Install a second nut on the other side of the form or template.
3. Adjust the nuts to hold the bolt rigidly in the proper position.

D. Clean embedment’s before installation.

E. Clean concrete spatter and other foreign substances from surfaces not in contact with concrete.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, elevated slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318; ACI 350; and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Coordinate placement of reinforcing steel with formwork, formed openings, and other work.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Welding of reinforcement is not permitted without prior approval of the Structural Engineer of Record.

E. Verify requirements and compliance for concrete cover over reinforcement.

F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

G. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

H. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.

I. Ensure all embedded parts are placed and tied to reinforcement before placing additional bars, to ensure adequate placement and connections.

J. Lap splices shall have a minimum two ties per spliced length.

1. For galvanized reinforcing, tie wires and metal clips shall be plastic coated or galvanized.

K. Accurately position reinforcing steel on supports, spacers, hangers, or other reinforcing steel at maximum intervals of 4 feet on center.

L. Reinforcing bars shall be secured with wire ties or suitable clips. Tie 50 percent of all reinforcement and reinforcement at intersections for all wall and floor construction.

M. All dowels, anchorages, waterstops, formwork for openings, pipe sleeves, bearing plates and angles, and other embedment's shall be secured in place and tied to reinforcement, before depositing concrete. Embedment's shall be securely tied to not deviate from required position.

N. Dowel all vertical wall reinforcement to foundations. Securely tie all rebar, including dowels in location before placing concrete or grout. "Stabbing" of bars into poured concrete is not permitted.

O. Except at contact splices, minimum clear distances between bars to be the greater of:

1. Nominal diameter of bars
2. 1.5 times maximum size of aggregate
3. 3 inch in other locations

P. Where reinforcement is placed in 2 layers, place bars in upper layer, directly above bars in lower layer.

Q. Do not use brick or porous material to support footing or slab steel off the ground.

R. Reinforcement with kinks or improper bends shall not be used. Reinforcement shall not be bent or straightened in a manner that will injure the material. Reinforcing bars partially embedded in hardened concrete shall not be field bent except for realignment up to a 30 degree bend, and shall only be bent once.

1. If additional field bending is necessary to access the interior area of the reinforced walls; Contractor MUST get approval by the Engineer and the Structural Engineer of Record to determine the acceptability and proper methods of field bending such bars. Proper methods determined by the Structural Engineer of Record must be followed.

2. The Contractor shall NOT field bend any reinforcement that is embedded in a prior pour without consulting the Engineer and the Structural Engineer of Record for approval.

S. Splices:

1. Splices to be as specified on the project drawings.
2. Splices at other locations may be acceptable, if approved by the Engineer.
3. Do not weld or tack weld reinforcing steel except if approved by the Engineer and Structural Engineer of Record.
4. Remove and replace steel upon which any unauthorized welding has been performed.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Space vertical joints in walls as indicated.
3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to one-fourth of concrete thickness – or as indicated on the Project Drawings, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch - wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Terminate full-width joint-filler strips as indicated on the Project drawings - though not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, are indicated.
2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 WATERSTOPS

A. Provide Watertight joints with continuous waterstops as indicated on the Project Drawings.

B. Waterstops shall be installed at the locations shown on the Project Drawings to form a continuous fluid-tight diaphragm. Adequate provision shall be made to support and completely protect the waterstops during the progress of the work. Exposed waterstops shall be protected during application of form release agents to avoid being coated. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued.

C. Self-Expanding Strip (Hydrophilic) Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

D. Hydrophilic Waterstop - Application of Primer Adhesive:

1. Remove loose particles and dirt and apply primer adhesive to 24-hour cured and dry concrete surface.
2. Brush apply one coat of primer adhesive two inches wide continuously along joint.
3. Allow primer adhesive to cure (per manufacturer’s directions) prior to application of waterstop.

E. Hydrophilic Waterstop:

1. Position waterstop on joint as indicated on the Project Drawings with a minimum of 2 inches of concrete cover on all sides
2. Press strip waterstop firmly and continuously in place over primed area on first concrete pour.
3. Butt ends of strip coil. Press ends together to ensure no separation and no air pockets. Place in maximum practical lengths to minimize splicing. Cut coil ends square with a sharp blade to fit splices together without overlaps.
4. Immediately prior to placing second pour, inspect waterstop for damage, discontinuity, premature swelling, and debris contamination. Replace damaged waterstop. Remove unacceptable waterstop from site and dispose of defective material in accordance with local regulations.
5. Remove the separation paper from the strip waterstop immediately prior to second pour.
6. Place concrete without displacing waterstop from position.
7. Thoroughly and systematically vibrate concrete around waterstop to obtain impervious, void-free concrete in vicinity of joint and to maximize intimate contact between concrete and waterstop. Do not allow vibrator to contact the strip waterstop.

F. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

G. Ribbed Center Bulb Waterstops:

1. Size and thickness as indicated in Part 2 of this specification.
2. Clean and free of coatings that would weaken the bond with concrete.
3. Continuous through the length of the construction joint.
4. Butt junctions between adjacent sections and securely heat weld together.
    a. Waterstop tees shall be factory fabricated and supplied by the manufacturer, leaving only straight butt joint splices for the field.
    b. The splicing of straight lengths shall be done by squaring the ends to be joined; keeping them clean and dry; and using the waterstop splicing tool specified by the manufacturer.
    c. Continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions, etc) shall be maintained across the splice.
    d. All splicing and welding of waterstops are to be done per the manufacturer's recommendations and instructions. DO NOT LAP SECTIONS OF WATERSTOP.

H. Retrofit Waterstops:

1. Size and thickness as indicated in Part 2 of this specification.
2. Clean and free of coatings that would weaken the bond with concrete.
3. Continuous through the length of the construction joint.
4. Butt junctions between adjacent sections and securely heat weld together.
    a. Waterstop tees shall be factory fabricated and supplied by the manufacturer, leaving only straight butt joint splices for the field.
    b. The splicing of straight lengths shall be done by squaring the ends to be joined; keeping them clean and dry; and using the waterstop splicing tool specified by the manufacturer.
    c. Continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions, etc) shall be maintained across the splice.
    d. All splicing and welding of waterstops are to be done per the manufacturer's recommendations and instructions. DO NOT LAP SECTIONS OF WATERSTOP.
5. Butt junctions between Ribbed centerbulb & Retrofit per Manufacturers instructions & details. Match rib to rib – bulb to bulb when splicing together.

I. Ribbed Center Bulb & Retrofit Waterstop - Splicing: Splices shall be made by a certified, trained personnel. Ensure the thermoplastic splicing iron has a non-stick surface specifically designed for the waterstop being spliced, and is at proper temperature to splice waterstop without charring the plastic, per the manufacturer's recommendations.

J. Any waterstop punctured or damaged shall be repaired per the manufacturer's requirements, or replaced.

K. Hog Rings/Grommets are to be factory installed spaced at 12 inches (maximum) on center along the length of the center bulb waterstop for proper securement to the reinforcing steel.

1. The waterstop must be securely tied in place to the reinforcing steel prior to placement of concrete.
2. Do not drive nails or other fasteners through waterstops; puncture additional holes in waterstops; or puncture the center bulb.

L. Maintain waterstop in proper position until surrounding concrete is deposited and compacted. Position all center bulb waterstops to ensure proper distance from the steel reinforcing bars, to prevent rock pockets and honeycombing of the concrete.

1. Allow a clearance between waterstop and reinforcing steel of a minimum of two times the largest aggregate site. Prevent rock pockets and air voids caused by aggregate bridging.

M. Ensure center bulb is not fully embedded in the first pour. Center the waterstop on the joint, with approximately one-half of the waterstop width to be embedded in the concrete on each side of the joint.

1. Clean concrete joint and waterstop after first pour to remove dirt and debris.

N. Uncoil center bulb waterstop 24 hours prior to installation for ease of handling and fabrication. TPV waterstops are typically black in color.

1. Waterstops to be laid out prior to placement in first pour to acclimate to the air temperature. Care should be taken after placement in the first pour and the curing process, that the TPV waterstop does not expand and the vertical tee joints shift in location. Cover the waterstop during hot weather, and cold weather to keep from elongating from temperature differentials.
2. Coordinate with waterstop supplier/manufacturer prior to installation regarding weather effects on the particular waterstop and methods to eliminate elongation.

O. Ribbed Center Bulb Waterstops shall be used at ALL NEW Horizontal and Vertical cold joints. Horizontal cold joints include the joint between foundation slab and walls; and Vertical cold joints between interior walls, and between interior and exterior walls.

1. No Horizontal or Vertical Cold joint shall be provided unless noted on the Project Drawings, or approved by the Engineer.
2. Cold joints between interior wall sections; and joints between the interior walls and exterior perimeter walls will be reviewed and approved by the Engineer.
3. Exterior walls should be placed in one continuous pour below the Main Process area.
4. The three exterior walls of the Headworks area must be placed in one continuous pour.

P. Retrofit Waterstops shall be used at all Hardened (existing) Concrete to NEW concrete at Horizontal & Vertical Cold Joints. Cold joints include the joint between foundation systems; & vertical cold joints between new and existing basin walls.

1. EOR will consider option for contractor to use Retrofit waterstops at all joints at Contractors request, to eliminate connection detail from Retrofit to ribbed centerbulb.

Q. Retrofit Waterstops to be installed per manufacturer's directions including but not limited to:

1. Prepare existing concrete by grinding away any irregularities.
2. Thoroughly clean existing concrete using a wire brush, high pressure waterblast or sand blast.
3. Heatweld waterstop profile to appropriate length and directional changes to fit concrete surface.
    a. Heatweld Retrofit (Rib to Rib; Bulb to Bulb) waterstop to Ribbed centerbulb waterstops per Manufacturers details & recommendations; -OR- Coordinate with EOR for Alternative options from Manufacturer.

4. Check heat welded waterstop for proper location; orientation & fit.
5. Using pre-punched stainless steel batten bar as a template, drill ¼ inch holes; 2 ¾ inch deep through waterstop and hardened concrete. Clean out holes.
6. Mix appropriate amount of epoxy per mixing instructions per manufacturer.
7. Place epoxy strip 1/8 inch thick by 4 ½ inch wide on concrete surface.
8. Embed waterstop into strip of uncured epoxy.
    a. During cold weather – refer to manufacturer's recommendations for placing epoxy in cold weather applications.
9. Place stainless steel batten bar against flat leg of waterstop & install tapcon screws into drilled holes, passing anchor through batten bar, waterstop, and epoxy gel bed. Repeat for all holes & tighten fasteners.
10. Allow installed retrofit waterstop system to cure for 24 hours before placing the new concrete around exposed web.

3.8 TRANSPORTING MIXED CONCRETE

A. Transporting of mixed concrete shall conform to ACI 304R – Guide for Measuring, Mixing, Transporting and Placing concrete; & ASTM C94 – Standard Specification for Ready-Mixed Concrete.

B. Do not exceed manufacturer's guaranteed capacity of truck agitators. Maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

C. Do not incorporate additional mixing water into the concrete during hauling or after arrival at the delivery point, unless ordered by the Contractor & approved by the Engineer. If additional water is approved to be incorporated into the concrete, revolve the drum not less than 30 revolutions at mixing speed after the water is added and before placing the concrete.

D. Furnish a water measuring device in good working condition, mounted on each transit mix truck, for measuring the water added to the mix on the site, if approved by the Contractor and Engineer.

E. Provide delivery ticket and comply with delivery requirements.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, and subject to the approval of the Engineer.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Provide the Engineer 24 hours to complete inspection between finishing form work and scheduled time of concrete placement.

E. Predetermine limits at each pour as indicated on the drawings, and place all concrete within limits of pour in one continuous operation. Cold joints are not allowed unless identified on the drawings or approved by the Engineer. Do not interrupt successive placement or permit cold joints to occur where not approved.

1. Wall sections must be placed full height with NO horizontal cold joints or construction joints, except where noted on the project drawings and the joint between the base of the wall and the foundation slab. All joints must have a ribbed center bulb waterstop -or- retrofit waterstop as identified in Section 2 of this specification.
2. Provide construction joints at locations indicated on the Project Drawings only, unless approved otherwise in writing by the Engineer and the Structural Engineer of Record.

F. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints only if approved by the Engineer. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

G. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

H. Place each elevation of foundation slab in one single continuous pour with NO cold joints. Screed slabs level, maintaining surface flatness of maximum ¼ inch in 10 feet for flat slabs.

I. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
4. Minimum concrete temperature at time of mixing:
    a. When the Outdoor Temperature is below 30 degrees Fahrenheit: Concrete Temperature at mixing to be: 70 degrees Fahrenheit.
    b. When the Outdoor Temperature is between 30 degrees and 45 degrees Fahrenheit: Concrete Temperature at mixing to be: 60 degrees Fahrenheit.
5. Do not place heated concrete that is warmer than 80 degrees Fahrenheit.
6. If freezing temperatures are expected during curing, maintain the concrete temperature at or above 50 degrees Fahrenheit for 5 days or 70 degrees Fahrenheit for 3 days with forms in place.
7. Do not allow concrete to cool suddenly
8. Do not water cure during cold weather. Use membrane curing compound, if approved by the Engineer.

J. Hot-Weather Placement: Comply with ACI 305 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.
3. Do not allow concrete temperature to exceed 70 degrees Fahrenheit at placement.
4. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
5. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 pounds per square foot per hour as determined from ACI 305, Fig. 2.1.4.

K. Prepare previously placed concrete by cleaning with steel brush or sandblasting and applying bonding agent in accordance with manufacturer’s instructions.

L. Concrete cold joints to have additional concrete placement, must have the joining surface intentionally roughened by raking or other means to a depth of ¼ inch prior to additional concrete placement.

M. In locations where new concrete is doweled to existing work, drill holes in existing concrete, and insert dowels with epoxy resin system as specified on the project drawings. Epoxy dowels are allowed only at locations indicated on the project drawings.

N. Rigidly secure forms, reinforcing steel, embedment, and anchor bolts in proper position prior to placing concrete. Ensure reinforcement, inserts, embedded parts, pipe sleeves, waterstops, and mechanical or electrical embeds are not disturbed during concrete placement.

O. Remove all mud, water, ice, snow, frozen material, and debris from space to be occupied by concrete.

P. Clean surfaces encrusted with dried concrete from previous concrete operations.

Q. Convey to the point of final deposit by methods that will prevent separation or loss of ingredients.

R. Place concrete in final position without being moved laterally more than 5 feet.

S. Place concrete in approximately horizontal layers of proper depth for proper compaction, not more than 2 feet. Concrete shall not be allowed to drop freely more than 4 feet or through a cage of reinforcing steel.

T. After concreting is started, it shall be carried on as a continuous operation until each pour is complete as indicated by construction joints shown on the drawings. Ensure to place subsequent layer while the preceding layer is still plastic.

U. All concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around reinforcement and embedded fixtures, waterstops, and into corners of forms. Use of vibrating equipment to move concrete horizontally is not permitted.

V. Top elevation of foundation & interior basin walls to be as indicated on the project drawings and vertical tolerance is to be within ½ inch of specified elevation. (Unless noted or otherwise approved). The top of wall surface is to have a smooth trowel finish, with elevation as indicated on the drawings.

1. The final top of wall must be smooth and level for a level bearing surface of the precast floor beam system.
2. The inside edge of the top of concrete walls where left exposed, is to have a chamfer if/as indicated on the drawings. Chamfer can be provided from a chamfer strip – or during finishing operations.

W. Remove all laitance, debris, and surplus water from the tops of the forms by screeding, scraping or other effective means.

3.10 BONDING TO HARDENED CONCRETE

A. Place new concrete on rough, clean, damp faces of existing concrete.

B. All laitance and other unsound material shall be removed before additional concrete is placed against hardened concrete.

C. Remove surface mortar to expose aggregate.

D. Clean hardened concrete of all foreign substances, including curing compound, washed with clean water, and keep saturated 24 hours preceding placement of fresh concrete.

3.11 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces below grade, or not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to Interior Exposed Concrete surfaces, and Exterior Exposed Concrete surfaces above grade.
2. Provide a smooth rubbed finish on the Exposed Interior and Exterior Walls.
    a. Exposed Interior & Exterior walls & Columns to have a smooth rubbed finish with no fins or form lines, to be left exposed – or finished with a Epoxy Paint system at the interior surfaces where specified on the Project Drawings.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

D. Remove fins and other surface projections from all formed surfaces except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed.

E. Use a power grinder if necessary to remove projections and provide a smooth flush finish.

F. Fill all tie holes with epoxy grout.

1. At form tie locations; the tie holes shall be thoroughly cleaned, dampened, and grouted solid with a nonmetallic non-shrinking grout, immediately after form removal. The tie holes shall be filed and packed solid by rodding. The grout material and procedure shall be approved by the Engineer prior to starting work.
2. Tie hole grout to have a flush finish to match the texture of adjacent concrete.

G. Grout clean surfaces exposed to view to produce a smooth uniform surface free of marks, voids, surface glaze and cement dust.

H. Voids between pipe link seals and concrete surface (interior and exterior) to be packed with non-shrinking grout; where indicated on the drawings.

I. Use sand mortar mix with bonding agent. Dampen surface and apply with cork or rubber float.

3.12 FINISHING UNFORMED SURFACES - FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch/Roughened Surface: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.

1. Apply roughened surfaces at areas of slabs/footings or wall construction joints to receive adjacent concrete.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to all floor slab surfaces as indicated in this specification. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

G. Float finish buried or permanently submerged concrete not forming an integral part of a structure except as required to attain surface elevations, contours and freedom from laitance.

H. In areas with floor drains, maintain floor elevation at walls, and slope surfaces uniformly to drains as indicated on the drawings. Concrete floor surfaces are to be finished to vary no more than ¼ inch per 10 feet from specified elevation.

I. Finish concrete floor and slab surfaces with a uniform steel-troweled, broomed non-slip finish.

3.13 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases as indicated on the project drawings.
3. Minimum Compressive Strength: 4000 psi at 28 days, unless noted otherwise.
4. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.14 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Cure concrete surfaces to requirements of specification Section 03 37 00 – Concrete Curing.

C. Immediately after placement, protect and cure concrete.

D. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

E. Cure concrete by methods that will keep concrete surfaces adequately wet during curing, in accordance with ACI 308.

3.16 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than 14 days' old, and allow concrete to cure the appropriate time as indicated by the manufacturer.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.17 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.18 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by the Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer’s approval.

1. Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements will be considered defective concrete.
2. Repair or replacement of defective concrete will be determined by the Engineer.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse

aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Engineers approval, using epoxy adhesive and patching mortar.

3.19 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Comply with Section 01 40 00 – Quality Requirements.

B. Testing and Inspecting: Owner will egage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement: Inspecting of reinforcing steel & placement.
2. Inspection of Headed bolts and studs cast in concrete.
3. Inspection of Post Installed Anchors.
4. Verification of use of required design mixture.
5. Inspection of formwork for shape; location; and dimensions of concrete members being formed.
6. Fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.
7. Concrete placement, including conveying and depositing.
8. Curing procedures and maintenance of curing temperature.
9. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day; nor less than once for each 5000 square feet of surface area for slabs and walls.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M. Provide (8) total cylinder specimens for each composite sample.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one field-cured specimen at 3 days if requested by the contractor; one at 7 days; and the remaining set of two specimens at 28 days; unless determined otherwise by the Engineer or Structural Engineer of Record.
        1) One can be tested at 14 days if necessary to determine strength.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. One additional test cylinder for each compression test specimen set, shall be taken during cold weather concreting, cured on the job site under the same conditions as the concrete it represents, in accordance with “Practice for Making and Curing Concrete Test Specimens in the Field” ASTM C31
10. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
11. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
12. Test results shall be reported in writing to the Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
13. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Engineer but will not be used as sole basis for approval or rejection of concrete.
14. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by the Engineer. Testing and inspecting agency

may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by the Engineer.

15. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
16. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

3.20 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

SECTION 03 37 00 – CONCRETE CURING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes: Initial and final curing of horizontal and vertical concrete surfaces.

B. Related Sections:

1. Section 01 33 23 – Submittal Procedure
2. Section 03 30 00 – Cast In Place Concrete

1.3 REFERENCES

A. ACI 301 – Standard Specification for Structural Concrete for Buildings
B. ACI 302.1R- Guide for Concrete Floor and Slab Construction
C. ACI 308 – Standard Practice for Curing Concrete
D. ACI 350 – Environmental Engineering Concrete Structures
E. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete
F. ASTM C309 – Standard Specification for Liquid Membrane – Forming Compounds for curing Concrete.
G. ASTM D2103 – Standard Specification for Liquid Membrane –Forming Compounds for curing Concrete.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated, and used.
   1. Provide manufacturers data sheets on curing methods and components, film, compatibilities, and limitations.

B. Procedure: Provide a Summary & Schedule of curing procedures to be utilized on each surface; to the Engineer and Structural Engineer of Record for review and approval prior to construction.

   1. The Schedule must identify the type of curing procedure proposed for each surface and proposed duration, in coordination with the project construction schedule.

C. Verification Samples: For each finish product proposed to be used, two samples, minimum size 4 inches square, representing actual product and color of wet cure covers.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

B. Perform work in accordance with ACI 301; ACI 302; & ACI 308.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver; handle; store; and protect all curing materials according to the manufacturer’s recommendations and in manufacturers packaging, including application instructions.

B. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

C. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Membrane Curing Compound Type A: ASTM C309, Type 1, Class A chlorinated rubber type, clear or colored as indicated in subsection 3 of this specification.

B. Saturated Wet Covering such as burlap, cotton mats, & rugs: Any covering must be new and suitable for drinking water, and must not leave any un-acceptable residue.

C. Impervious paper or plastic sheets.

D. Water: Potable, not detrimental to concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Immediately after placement, protect all concrete from premature drying, moisture loss, & excessively hot or cold temperatures and mechanical injury.

1. Curing should begin immediately after finishing, and must ensure continued hydration of the cement; strength gain of the cement; and a minimum of early drying shrinkage.
2. All newly placed and finished concrete walls and slabs must be cured and protected from drying; extreme changes in temperature; and from damage by subsequent construction traffic.

B. Verify that substrate surfaces are ready to be cured.

C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete. Concrete shall be maintained above 50 degrees F and in a moist condition for at least the first 7 days after placement.

D. Cure concrete by methods that will keep concrete surfaces adequately wet during curing, in accordance with ACI 308.

E. Maintain rate of temperature change less than 5 degrees Fahrenheit in any one (1) hour period.

3.2 PREPARATION

A. In cold weather, arrangement must be made in advance for heating, covering, insulating, or enclosing the concrete.

1. Cold weather curing must be in accordance with ACI 306.

B. In hot weather, special precautions must be taken against rapid evaporation and drying due to high temperatures, drying conditions, and wind.

1. Hot weather curing must be in accordance with ACI 305.

3.3 EXECUTION – HORIZONTAL SURFACES

A. Concrete curing shall be performed in accordance with ACI 308, unless modified by the Construction Documents.

B. Foundation Slabs: Must be Moist-Cured continuously from the time they are placed and finished until they have gained sufficient strength; impermeability; and durability. All exposed surfaces, including exposed edges and joints must be protected against moisture evaporation.

C. Moist-Cured Methods include:

1. Ponding or Immersion: Maintain 100 percent coverage of water over foundation slab areas, continuously for 7 days – or the time necessary to achieve 70 percent of the design compressive strength; whichever is less.
    a. The curing water should not be more than about 20 degrees Fahrenheit cooler than the concrete, to prevent thermal stress that could result in cracking.
    b. Exposed edges and joints must be protected by wet coverings; fogging; or immersion.
    c. The water used for curing by ponding or immersion must be free of substances that will stain or discolor the concrete.

2. Fogging and Sprinkling: Fogging and Sprinkling must be done continuously for the curing period. If sprinkling must be done at intervals, the concrete MUST be prevented from drying between applications of water by using burlap or similar materials.

a. The ambient temperature must be well above freezing, with humidity low, and expected temperatures to remain above freezing for the duration of the curing time.
b. A Fine fog mist to be frequently applied through a system of nozzles or sprayers to raise the relative humidity of the air over the formwork.
c. Lawn sprinklers can be used if good coverage is provided.
d. Alternative cycles of wetting and drying – or intermittent sprinkling is NOT allowed, as can cause surface crazing or cracking.
e. Care must be taken that erosion of the surface does not occur.
f. Keep the concrete surfaces continuously wet.

3. Wet Coverings: Fabric coverings saturated with water, such as burlap; cotton mats; rugs or other moisture-retaining fabrics.

a. Burlap shall meet the requirements of AASHTO M182.
b. Burlap must be free of any substance that is harmful to concrete or causes discoloration such as sugar or fertilizer. Burlap should be thoroughly rinsed in water to remove soluble substances and to make the burlap more absorbent.
1) The heavier the burlap, the more water will retain and less frequently it will need to be wetted.
c. Wet, moisture-retaining fabric coverings should be placed as soon as the concrete has hardened sufficiently to prevent surface damage. During the waiting period other curing methods such as fogging should be used.
d. Care should be taken to cover the entire surface with wet fabric, including the edges of slabs.
e. The fabric strips should be lapped by half widths when placed to provide greater moisture retention and aid in preventing displacement during high wind or heavy rain.
f. The coverings should be kept continuously moist so that a film of water remains on the concrete surface throughout the curing period.
g. Use of polyethylene film over wet burlap is permitted. Periodic wetting of the fabric under the plastic before the fabric dries will be required.
h. Alternate cycles of wetting and drying is NOT allowed.
i. Keep the concrete surfaces continuously wet.

D. Slab on Grade: Shall be cured by: Spraying or Fogging; Moist-Cured with Saturated Wet Coverings; or approved Membrane Curing compound.

1. Membrane Curing Compound: Apply curing compound in accordance with manufacturer's instructions in two coats with second coat applied at right angles to the first. Curing compound shall not be used on surfaces where additional concrete will be placed, unless it is demonstrated that it will not jeopardize bonding.

3.6 PROTECTION OF FINISHED WORK

A. Protect finished work from cosmetic and structural damage.

B. Do not permit traffic over unprotected floor/slab surfaces.

END OF SECTION 03 37 00

SECTION 03 60 00 - GROUTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Grouting of Equipment and support systems base plates.
   2. Grouting of anchors and dowels into existing concrete
   3. Patching cavities in concrete.
   4. Other grouting specified or indicated on drawings.
      a. Grouting of Concrete Masonry Units is NOT included in this specification. See Section 04 22 00 “Concrete Unit Masonry” for CMU Grout specifcations.

B. Related Sections:
   1. Section 01 33 23 – Submittal Procedures
   2. Section 03 30 00 - Cast-In-Place Concrete
   3. Section 03 41 00 – Precast Structural Concrete
   4. Section 05 50 00 – Metal Fabrications
   5. Section 05 50 10 – Anchor Bolts and Expansion Anchors

1.3 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 318 - Building Code Requirements for Structural Concrete.
   3. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures.

B. American Society of Testing and Materials:
   1. ASTM C33 - Standard Specification for Concrete Aggregates.
   2. ASTM C40 - Test Method for Organic Impurities in Fine Aggregates for Concrete.
   3. ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
   4. ASTM C150 - Standard Specification for Portland Cement.
   5. ASTM C157 – Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar and Concrete.
   6. ASTM C191 - Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
   7. ASTM C307 - Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacings.

C. U. S. Army Corps of Engineers Concrete Research Division (CRD):
   1. CRD C621 - Non-Shrink Grout.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Provide manufacturer’s catalog sheet for material indicating test data and physical properties.

C. Manufacturer's Installation Instructions: Submit manufacturer’s instructions for mixing, handling, surface preparation and placing epoxy type and non-shrink type grouts.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Confirm to applicable industry standard as specified in CRD-C-621.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver grout in manufacturer's unopened containers with proper labels intact.

B. Store grout in a dry shelter, protect from moisture.

PART 2 PRODUCTS

2.1 PORTLAND CEMENT GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I and II.

B. Water:
   1. Potable; containing no impurities, suspended particles, algae or dissolved natural salts in quantities capable of causing:
      a. Corrosion of steel.
      b. Volume change increasing shrinkage cracking.
      c. Efflorescence.
      d. Excess air entraining.

C. Fine Aggregate:
   1. Washed natural sand.
   2. Gradation in accordance with ASTM C33 and represented by smooth granulometric curve within required limits.
   3. Free from injurious amounts of organic impurities as determined by ASTM C40.

D. Mix:
   1. Portland cement, sand and water. Do not use ferrous aggregate or staining ingredients in grout mixes.

2.2 EPOXY GROUT/ADHESIVE

A. Manufacturers:

1. Sika
2. Master Builders
3. Hilti
4. Sikadur
5. Or Equal

2.3 NON-SHRINK CEMENTITIOUS GROUT

A. Manufacturers:

1. Master Builders – Masterflow 928
2. Burke – Non Ferrous Non-Shrink
3. L & M Inc. – Crystex
4. M.R. Meadows – Sealtight 588
5. Sonneborn – Sonogrout G.P.
6. Tamms – Tammsgrout 621
7. Sika – Sika Grout 212
8. Or Equal

B. Non-shrink Cementitious Grout: Pre-mixed ready for use formulation requiring only addition of water; non-shrink, non-corrosive, non-metallic, non-gas forming, no chlorides.

C. Properties: Certified to maintain initial placement volume or expand after set and meet the following minimum properties when tested in accordance with CRD-C621, for Type D non-shrink grout:

Property	Test	Time	Result
Setting Time	ASTM C191	Initial	2 hours (Approx)
		Final	3 hours (Approx)
Expansion			0.10% - 0.4% Maximum
Compressive Strength	CRD-C621	1 day	4,000 psi
		28 days	8,000 psi to 10,000 psi

2.4 CURING

A. Prevent rapid loss of water from grout during first 48 hours by use of approved membrane curing compound or with use of wet burlap method.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of existing conditions before starting work.

B. Verify areas to receive grout.

3.2 PREPARATION

A. Remove defective concrete, laitance, dirt, oil, grease and other foreign material from concrete surfaces by brushing, hammering, chipping or other similar means until sound, clean concrete surface is achieved.

B. Rough concrete lightly, but not enough to interfere with placement of grout.

C. Remove foreign materials from metal surfaces in contact with grout.

D. Align, level and maintain final positioning of components to be grouted.

E. Saturate concrete surfaces with clean water; remove excess water, leave none standing.

F. Cold weather conditions:

1. Warm concrete, substrate and baseplate to 40 degree Fahrenheit, or above; store grout in warm area.
2. Follow manufacturer’s recommendations for Cold weather application.

G. Hot weather conditions:

1. Use cold mixing water and cool baseplate if possible; store grout in cool area.
2. Follow manufacturer’s recommendations for hot weather application.

3.3 MIXING

A. Portland Cement Grout:

1. Use proportions of 2 parts sand and 1 part cement, measured by volume.
2. Prepare grout with water to obtain consistency to permit placing and packing.
3. Mix water and grout in two steps; pre-mix using approximately 2/3 of water; after partial mixing, add remaining water to bring mix to desired placement consistency and continue mixing 2 to 3 minutes.
4. Mix only quantities of grout capable of being placed within 30 minutes after mixing.
5. Do not add additional water after grout has been mixed.
6. Capable of developing minimum compressive strength of 2400psi in 48 hours and 7000 psi in 28 days.

B. Mix and prepare epoxy grout in accordance with manufacturer's instructions.

C. Mix and prepare non-shrink cementitious grout in accordance with manufacturer's instructions.

D. Mix grout components in proximity to work area and transport mixture quickly and in manner not permitting segregation of materials.

3.4 PLACING GROUT

A. Place grout material quickly and continuously.

B. Do not use pneumatic-pressure or dry-packing methods.

C. Apply grout from one side only to avoid entrapping air.

D. Do not vibrate placed grout mixture, or permit placement when area is being vibrated by nearby equipment.

E. Thoroughly compact final installation and eliminate air pockets.

F. Do not remove leveling shims for at least 48 hours after grout has been placed.

G. Non-Shrink; Non-Metallic Grout:

1. Mix in a mechanical mixer
2. Use no more water than necessary to produce flowable grout
3. Provide air vents where necessary to eliminate air pockets.
4. Place in accordance with manufacturer’s instructions.
5. Completely fill all spaces and cavities below the top of baseplates.
6. Provide forms where baseplates and bedplates do not confine grout.
7. Where exposed to view finish grout edges smooth.
8. Except where a slope is indicated on the drawings, finish edges flush at the baseplate, bedplate, member or piece of equipment.
9. Protect against rapid moisture loss by immediately covering with wet rags and polyethylene sheets or curing compound.
10. Wet cure grout for 7 days, minimum.
11. Maintain the temperature at a minimum of 40 degree Fahrenheit until grout reaches 3000 psi.

H. Epoxy/grout adhesive – for Adhesive Anchors

1. Apply only to clean, dry, sound surface.
2. Epoxy grout to be a two component system consisting of a resin and hardener.
3. Each components furnished in separate tubes within cartridge.
4. Drill hole to proper diameter and depth.

5. Clean hole removing laitance and debris.
6. Dispense adhesive into hole
7. Insert dowel or threaded rod, slowly turning during insertion.
8. Obtain manufacturer's field technical assistance as required to insure proper placement.

3.5 CURING

A. Immediately after placement, protect grout from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. After grout has attained its initial set, keep damp for minimum of 3 days.

3.6 SCHEDULE

A. Non-Shrink, Non-Metallic Grout: General Use
   1. Grouting equipment baseplates.

B. Epoxy Grout/adhesive
   1. Patching cavities in concrete including, but not limited to tie holes.
   2. Grouting of dowels and anchor bolts into existing concrete.

END OF SECTION 03 60 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Shop-fabricated metal items.
2. Structural supports for miscellaneous attachments.

B. Related Sections:

1. Section 01 33 23 – Submittal Procedures
2. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for embedded anchors and attachments for metal fabrications specified by this Section in concrete.
3. Section 03 60 00 - Grouting
4. Section 05 50 10 – Anchor Bolts and Expansion Anchors
5. Section 40 05 29 – Hangers and Supports for Process Piping and EquipmentREFERENCE STANDARDS

A. American Institute of Steel Construction
1. AISC – Code of Standard Practice – Manual of Steel Construction.

B. American Welding Society:
1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
2. AWS D1.1 - Structural Welding Code - Steel.
3. AWS D1.6 - Structural Welding Code - Stainless Steel.
4. AWS D19.0 – Welding Zinc Coated Steel (Galvanized)

C. ASTM International:
1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A53- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
6. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.
7. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

8. ASTM A312 - Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
9. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
10. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
11. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
12. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
13. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
14. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
15. ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
16. ASTM A992 - Standard Specification for Structural Steel Shapes.
17. ASTM F436 - Standard Specification for Hardened Steel Washers.
18. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed by others.

D. Manufacturer’s (fabricator’s) installation instructions when applicable.

1.5 QUALITY ASSURANCE

A. Finish joints according to NOMMA Guideline 2.

B. Installation of products shall comply with the drawings, or when applicable the manufacturer’s recommendations.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept metal fabrications on-Site in labeled shipments. Prior to installation, inspect for damage.

C. Protect metal fabrications from damage by exposure to weather or by ground contact.

D. Protect materials from bending under its own weight or super-imposed load.

1.7 REGULATORY REQUIREMENTS

A. Comply with all applicable provisions of 29 CFR 1926 for handrails.

1.8 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 FLOOR MOUNTED PIPE SUPPORTS

A. Comply with Section 40 05 29 “Hangers and Supports for Process Piping and Equipment”

2.2 WALL MOUNTED PIPE SUPPORTS

A. Comply with Section 40 05 29 “Hangers and Supports for Process Piping and Equipment”

2.3 MISCELANEOUS MATERIALS

A. Steel:

1. Structural W Shapes: ASTM A992.
2. Channels and Angles: ASTM A36.
3. Steel Plate: ASTM A36.
4. Hollow Structural Sections: ASTM A500, Grade B.
5. Steel Pipe:
   a. ASTM A53, Grade B.
6. Sheet Steel: ASTM A653, Grade 33 Structural Quality.
7. Bolts: ASTM A307; Grade A or B.
8. Nuts: ASTM A563; heavy-hex type.
9. Washers: ASTM F436; Type 1.
10. Welding Materials: AWS D1.1; type required for materials being welded.

B. Stainless Steel:

1. Bars and Shapes: ASTM A276; Type 304 or 316.
2. Tubing: ASTM A269; Type 304 or 316.
3. Pipe: ASTM A312 seamless; Type 304 or 316.

4. Plate, Sheet, and Strip: ASTM A666; Type 304 or 316.
5. Bolts, Nuts, and Washers: ASTM A354.
6. Welding Materials: AWS D1.6; type required for materials being welded.

C. Bolts, Nuts, and Washers for Equipment and Piping:

1. Carbon Steel:
   a. Structural Connections: ASTM A307, Grade A, hot-dip galvanized.
   b. Anchor Bolts: ASTM A307, Grade A, hot-dip galvanized.
   c. Pipe and Equipment Flange Bolts: ASTM A193, Grade B-7.
2. Stainless Steel: Type 316 stainless steel, Class 2; ASTM A193 for bolts; ASTM A194 for nuts.
3. Expansion Anchors: "Hilti Kwik Bolt 3" – Stainless steel. An equivalent manufacturer's product may be used if approved by the Engineer.
4. Epoxy Anchors: Stainless Steel threaded rod with Epoxy adhesive as indicated on the project drawings and specification section 05 50 10.

2.4 FABRICATION - GENERAL

A. Fit and shop-assemble items in largest practical sections for delivery to Site. Fabricate steel members in accordance with dimensions, arrangement, sizes, and weights or thickness indicated on the Project Drawings.

B. Steel members to be free of winds, warps, local deformation, or unauthorized bends.

C. Fabricate items with joints tightly fitted and secured.

D. Continuously seal joined members by continuous welds.

E. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small, uniform radius.

F. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members in final structure free of markings, burrs, and other defects.

G. Shear connectors: Prepare steel surfaces as recommended by manufacturer of shear connector. Shop weld shear connectors, spaced as shown. Weld per AWS specifications.

H. Substitutions: Where exact sizes and weights called for are not readily available, secure the Engineer's acceptance of suitable sizes in time to prevent delay due to such substitutions.

I. Cut, drill, or punch holes perpendicular to metal surfaces. Do no flame cut holes or enlarge holes by burning. Drill holes in bearing plates. Perform all necessary cutting, fitting, and drilling before steel is delivered. No cutting or drilling will be permitted on the job without the acceptance of the Engineer.

J. Holes and other provisions for field connection to be accurate and shop checked for proper fit.

2.5 FINISHES

A. All steel members and connections to be located at the inside of the tanks and process area are to be stainless steel.

B. Where other steel is to be provided the following finishes shall be used, as indicated on the project drawings.

1. Galvanize and paint all structural steel in accordance with the Steel Structures Painting Council's specifications and recommendations. Complete in shop.
2. Galvanizing:
   a. Galvanize steel shapes; plates; tubes; and bars per ASTM A123.
   b. Galvanize hardware per ASTM A153.
3. Surface Preparation:
   a. Prepare galvanized surface for painting according to ASTM D2092-95 and SSPC SPI-63.
4. Painting:
   a. Epoxy polyurethane – Apply one primer coat of epoxy polyamide to give 3 mils dry thickness, followed by one finish coat aliphatic urethane to give a total minimum dry thickness of 5 mils.
   b. Acrylic Latex – Apply two coats of epoxy polyamide to give a minimum total dry thickness of 6 mils.
5. Store finished steel in a dry covered location elevated so as not to be in contact with the ground.
6. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
7. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Stainless Steel:
1. Satin-Polished Finish: Number 4, satin directional polish parallel with long dimension of finished face.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 73 40 - Execution: Requirements for installation examination.

B. Verify that field conditions are acceptable and are ready to receive Work.

3.2 PREPARATION

A. Section 01 73 40 - Execution: Requirements for installation preparation.

B. Clean and strip primed steel items to bare metal where Site welding is required.

C. Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

D. Before assembly, thoroughly clean all parts that will be in contact with each other.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, and free from distortion or defects.

B. Assemble all parts accurately as indicated on the Project Drawings.

C. Make provisions for erection stresses. Install temporary bracing to maintain alignment until permanent bracing and attachments are installed.

D. Field-weld components indicated on Drawings.

1. Where field welded is permitted or required, use continuous butt a miter welds.
2. Where intermittent welds are permitted, provide minimum effective length of 2 inches and maximum spacing of 6 inches.
3. Grind smooth exposed welds.

E. Perform field welding according to AWS D1.1.

F. Shop & Field welding of Galvanized coated members is to be done in accordance with AWS D19.0 – Welding Zinc Coated Steel (Galvanized); American Galvanizers Association Publication: Welding & Hot-Dip Galvanizing and to be done by an welder with experience in welding of galvanized members.
1. Welding galvanized steel without removing the galvanize coating will result in emission of a heavy, noxious yellow-green smoke that will envelop the welder. Continuous exposure to this smoke can result in galvanize poisoning.

G. Obtain approval of Engineer (CO) prior to Site cutting or making adjustments not scheduled.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Maximum Variation from Plumb: 1/4 inch for every 12 feet in height

C. Maximum Variation from Level: 1/16 inch in 3 feet

D. Maximum Offset from Alignment:1/4 inch

E. Maximum Out-of-Position: 1/4 inch

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Welding: Inspect welds according to AWS D1.1.

C. Replace damaged or improperly functioning hardware.

D. Touch up factory-applied finishes according to manufacturer-recommended procedures.

3.6 ADJUSTING

A. Section 01 73 40 - Execution: Requirements for starting and adjusting.

B. Adjust operating hardware and lubricate as necessary for smooth operation.

END OF SECTION 05 50 00

SECTION 05 50 10 – ANCHOR BOLTS AND EXPANSION ANCHORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete
   2. Section 03 60 00 – Grouting
   3. Section 04 22 00 – Concrete Unit Masonry
   4. Section 05 12 00 – Structural Steel Framing
   5. Section 05 50 00 – Metal Fabrications
   6. Section 06 82 00 – Glass Fiber Reinforced Plastic Fabrications

1.3 REFERENCE STANDARDS

A. American National Standards Institute
   1. ANSI B18.16.3M-98 – Dimensional Requirements for Prevailing Torque Type Steel Metric Hex Nuts and Hex Flange Nuts.
   2. ANSI B18.
   3. AA DAF-45 - Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association:
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2603 - Voluntary Specification21.1-94 – Lock Washers
   3. ANSI B18.22.1-65 – Plain Washers

C. ASTM International:
   1. ASTM A36 – Standard Specification for Carbon Structural Steel
   2. ASTM A53- Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM A193 - Standard Specification for Alloy-Steel and Stainless-Steel Bolting for High Temperature or High-Pressure Service and Other Special Purpose Applications.
   4. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings: Provide sizes and dimensions. Indicate location where anchor bolts are to be used.

C. Product Data: Provide sufficient information to verify compliance with specifications.

1.5 QUALITY ASSURANCE

A. Unless otherwise specified or shown on the Drawings, anchor bolts for equipment provided under this Contract shall be designed and sized by the responsible equipment manufacturer as specified in these project specifications.

B. Unless otherwise specified, the Contractor shall provide and install all anchor bolts for this contract in accordance with the responsible manufacturer's design recommendations or as shown on the Drawing Sheets.

C. Anchor bolt templates for equipment shall be provided by the responsible manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle products and materials as specified in these project specifications.

B. Deliver anchor bolts and templates in time to permit setting when structural concrete is placed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Expansion Anchors: As indicated on the Project Drawings

1. Unless otherwise indicated on the Drawings, provide Stainless Steel threaded expansion anchors conforming to ASTM A183; ASTM A1943; ASTM F593; and STM F594.

B. Expansion anchors for concrete shall be:

1. Hilti "Kwik-Bolt 3" with a diameter of not less than ½ inch nor greater than $^{5}/_{8}$ inch, coordinate with the drawings for appropriate size.
2. Ramset/Red Head Product
3. Or Equal

C. Adhesive Anchors:

1. Cartridge Injection Adhesive Anchors: Threaded steel rod, complete with nuts, washers, hybrid mortar adhesive injection system, and manufacturer's installation instructions. Type and size as indicated on the Drawings.
2. Unless otherwise indicated on the Drawings, provide Stainless Steel threaded rods, conforming to ASTM F593, Type 304 or 316.
3. Where adhesive anchors are specified, utilize the following Adhesive Anchorage systems:
4. Stainless Steel Threaded rods with Hilti HIT HY-200: Adhesive Anchorage System for anchorage to concrete.

5. If base material is lower than 14 degrees F, the space must be warmed and anchorage installed when the base materials meet the requirements of the manufacturer for the required time period.

2.2 MATERIALS

A. Bolts or threaded rods:

1. General Use: Galvanized carbon steel ASTM A307.
2. Submerged Service: Stainless Steel ASTM A193, Grade 303 or 305.
3. Type 304 Stainless Steel where indicated on the Drawing Sheets.

B. Nuts:

1. Same material as bolts.
2. Carbon Steel: ASTM A307, heavy hexagonal.
3. Self-locking: ANSI B18.16.3M, Grade A

C. Washers:

1. Same material as bolts.
2. Flat: ANSI B18.22.1-65
3. Locking: Spring type, ANSI B18.21.1

D. Sleeves:

1. Pipe: ASTM A53
2. Bearing Plates: ASTM A36
3. Hot dip galvanize after fabrication.

E. Expansion Anchors:

1. General Use: Stainless Steel
2. Submerged Service: Stainless Steel

2.3 FABRICATION

A. Bolts: Carbon steel, high strength, size as required for piping flanges.

B. Anchor Bolts: ¾ inch minimum diameter except as indicated by equipment manufacturer or as indicated on the Drawing Sheets.

1. General Use: L-Shaped hook type for structural steel and wood framing, and anchoring equipment.
2. Use Headed bolts where shown on the Project Drawings.

C. Threaded rods: Anchorage into existing concrete. Use with epoxy/grout adhesive.

D. Expansion Anchors: $^{5}/_{8}$ inch maximum diameter, unless noted otherwise; length as required for proper embedment, or as indicated on the Project Drawings.

PART 3 EXECUTION

3.1 INSPECTION

A. Verify that holes for anchor bolts in forms and templates match applicable building shop drawings.

3.2 INSTALLATION

A. Anchor Bolts: General Use

1. Provide bolts for structural Steel framing and anchoring equipment.
2. Provide bolts for anchorage of steel joist bearing plates in Concrete Masonry Unit walls.
3. Where installed in cast-in-place concrete, install a nut on the concrete side of the form or supporting template.
4. Provide 3 nuts for each anchor bolt for which a lock nut is indicated; 2 for other cases.
5. Use templates to locate bolts accurately and securely in formwork.

B. Threaded rods: As specified in Section 03 30 00 – Cast-In-Place Concrete.

C. Expansion Anchors:

1. General Use: Where required for pipe supports, anchoring wall panels, and miscellaneous anchor requirements. Drilled-In-Expansive Anchors: Manufacturer instructions shall be strictly adhered to for all installations.
2. Drill holes with rotary impact hammer drills using carbide-tipped bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.
    a. Embedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling.
    b. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Verify installation requirements of HLC Sleeve anchor per manufacturer.
    a. Install sleeve anchors in holes drilled with Hilti carbide tipped drill bits.
    b. Drill the hole with carbide tipped bits. Clean the hole with blow out bulb.

c. Drive the sleeve anchor into the hole, place the nut flush to the top of the bolt before driving the sleeve anchor.

d. Tighten anchor to the recommended torque value provided by the manufacturer. Over torquing will reduce the pullout and shear loads, up to the point of complete failure.

4. Install in conformity with the manufacturer's instructions.

5. Minimum embedment: 4 bolt diameters or per manufacturer's recommendations, whichever is greater. Minimum distance between expansion anchor centerline any edge or exterior corner of concrete: 4 ½ bolt hole diameters.

6. When expansion anchors are indicated on the drawings, only an acceptable expansion anchor shall be used. Expansion anchors shall be installed in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of the hole be less than six bolt diameters.

D. Adhesive Anchors: Where indicated on the drawings.

1. Drill holes with rotary impact hammer drills using carbide-tipped bits. Drill bits shall be of diameters as specified by the anchor manufacturer. Unless otherwise shown on the Drawings, all holes shall be drilled perpendicular to the concrete surface.

a. Emedded Items: Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Exercise care in drilling to avoid damaging existing reinforcing or embedded items. Notify the Engineer if reinforcing steel or other embedded items are encountered during drilling.

b. Base Material Strength: Unless otherwise specified, do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.

2. Perform anchor installation in accordance with manufacturer instructions.

3. Clean all holes with a wire brush and air nozzle per manufacturer instructions to remove loose material and drilling dust prior to installation of adhesive. Inject adhesive into holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive. Follow manufacturer recommendations to ensure proper mixing and application of adhesive components. Sufficient adhesive shall be injected in the hole to ensure that the annular gap is filled to the surface. Remove excess adhesive from the surface. Shim anchors with suitable device to center the anchor in the hole. Do not disturb or load anchors before manufacturer specified cure time has elapsed.

4. Adhesive Anchors should only be used at the interior face of the tank & the tank floor; as indicated on the Project Drawings.

END OF SECTION 05 50 10

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Wood blocking and nailers.

B. Related Requirements:
   1. Section 06 16 00 "Sheathing" for sheathing, and underlayment.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.

B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Application: Treat all rough carpentry unless otherwise indicated.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 FASTENERS

A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
1. Use adhesive that have a VOC content of 70 g/l or less when calculated according to 40CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

C. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with

function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

E. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated,

complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
2. ICC-ES evaluation report for fastener.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

END OF SECTION 06 10 00

SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Roof sheathing.
   2. Wall sheathing.

B. Related Requirements:

   1. Section 06 10 00 "Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
   3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
   4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored.

Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WALL SHEATHING

A. Plywood Sheathing: Exterior sheathing.

1. Span Rating: Not less than 16/0.
2. Nominal Thickness: Not less than 1/2 inch.

2.3 ROOF SHEATHING

A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exterior sheathing.

1. Span Rating: Not less than 48/24
2. Nominal Thickness: Not less than ¾ inch.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. For roof sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

B. Screws for Fastening Composite Nail Base Insulated Roof Sheathing to Metal Roof Deck: Steel drill screws, in type and length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117. Provide washers or plates if recommended by sheathing manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

D. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

END OF SECTION 06 16 00

SECTION 07 11 13 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Cold-applied, emulsified-asphalt dampproofing.

B. Related Requirements:
   1. Section 07 13 26 "Self-Adhering Sheet Waterproofing" for waterproofing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 FIELD CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide molded-sheet drainage panels and auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

D. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

E. Protection Course: ASTM D 6506, 1/8-inch- thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core; and with a vertical flow rate of 9 to 15 gpm per ft.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other

imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.

1. Apply dampproofing to provide continuous plane of protection.
2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.

1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.

B. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft..

3.5 INSTALLATION OF PROTECTION COURSE

A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

3.6 INSTALLATION OF MOLDED-SHEET DRAINAGE PANELS

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate dampproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. Install protection course before installing drainage panels.

3.7 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION 07 11 13

SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Modified bituminous sheet waterproofing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Samples: For each exposed product and for each color and texture specified, including the following products:

1. 8-by-8-inch square of waterproofing and flashing sheet.
2. 4-by-4-inch square of drainage panel.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil nominal thickness, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side.

1. Physical Properties:

a. Tensile Strength, Membrane: 250 psi minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
g. Water Vapor Permeance: 0.05 perms maximum; ASTM E 96/E 96M, Water Method.
h. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.

2. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

G. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch thick.

2.4 INSULATION

A. Insulation, General: Comply with Section 07 21 00 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.

1. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

F. Bridge and cover isolation joints expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:

    a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
    b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.

D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal edges of sheet-waterproofing terminations with mastic.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.

3.4 FIELD QUALITY CONTROL

A. Flood Testing: Flood test each deck area for leaks, according to recommendations in ASTM D 5957, after completing waterproofing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

1. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches Maintain 2 inches of clearance from top of sheet flashings.
2. Flood each area for 24 hours.
3. After flood testing, repair leaks, repeat flood tests, and make further repairs until waterproofing installation is watertight.

B. Engage an independent testing agency to observe flood testing and examine underside of decks and terminations for evidence of leaks during flood testing.

3.5 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Protect installed board insulation from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 13 26

SECTION 07 25 00 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building paper.
2. Flexible flashing.
3. Drainage material.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

B. Shop Drawings: Show details of building paper at terminations, openings, and penetrations. Show details of flexible flashing applications.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

B. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper that complies with ICC-ES AC38, Grade D.

2.2 FLEXIBLE FLASHING

A. Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. DuPont Building Innovations: E. I. du Pont de Nemours and Company.
b. Grace Construction Products; W.R. Grace & Co. -- Conn.
c. Protecto Wrap Company.
d. Raven Industries, Inc.

B. Rubberized-Asphalt Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advanced Building Products Inc.
b. Fortifiber Building Systems Group.
c. Grace Construction Products; W.R. Grace & Co. -- Conn.

C. Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.

D. Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

2.3 DRAINAGE MATERIAL

A. Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. CavClear/Archovations, Inc.
b. DuPont Building Innovations: E. I. du Pont de Nemours and Company.
c. Keene Building Products.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

C. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

3.3 DRAINAGE MATERIAL INSTALLATION

A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

END OF SECTION 07 25 00

SECTION 07 26 00 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Polyethylene vapor retarders.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for under-slab vapor retarders.
2. Section 06 10 00 - Rough Carpentry
3. Section 07 21 00 "Thermal Insulation" for vapor retarders integral with insulation products.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 10-mil- thick sheet, with maximum permeance rating of 0.1 perm.

2.2 ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

B. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS ON FRAMING

A. Place vapor retarders on side of construction indicated on Drawings.

B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.3 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 07 26 00

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manufactured through-wall flashing with counterflashing.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include identification of material, thickness, weight, and finish for each item and location in Project.
2. Include details for forming, including profiles, shapes, seams, and dimensions.
3. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Include details of roof-penetration flashing.

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:
   a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: Match exterior steel siding.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

   a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
   b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
   c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Through-Wall, Ribbed, Sheet Metal Flashing: Manufacture through-wall sheet metal flashing for embedment in masonry, with ribs at 3-inch intervals along length of flashing to provide integral mortar bond. Manufacture through-wall flashing with interlocking counterflashing on exterior face, of same metal as flashing.

2.6 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

2.8 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Penetration Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

2.9 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- long, but not exceeding 12-foot- long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch- high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of uncoated-aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

D. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

E. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder aluminum sheet.
2. Do not use torches for soldering.
3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering.

Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 CLEANING AND PROTECTION

A. Clean and neutralize flux materials. Clean off excess solder.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Mildew-resistant joint sealants.
3. Latex joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.

4. Proposed test.
5. Number of samples required.

D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

F. Field-Adhesion-Test Reports: For each sealant application tested.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements

specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of interior sealants: Provide interior sealants and sealant primers that comply with the following limit for VOC content when calculated according to 40 CFR 59, subpart D (EPA Method 24):
1. Architectural sealant: 250 g/l
2. Sealant Primers for Nonporous Substrates: 250 g/l
3. Sealant Primers for Porous Substrates: 775 g/l

C. Colors of Exposed Joint Sealants: As selected by Engineer from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
1. Dow Corning Corporation; 790
2. GE Silicones; SilPruf LM SCS2700
3. Tremco Inc; Spectrem 1
4. Pecora Corporation; 864
5. Bondaflex Technologies; Sil 290

2.3 MILDEW-RESISTANT JOINT SEALANTS

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Dow Corning Corporation; 786 Mildew Resistant
2. GE Silicones; SCS1700

3. Tremco Inc; Tremsil 200
4. Bondaflex Technologies; Sil 100 WF

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type C, Grade NF.
1. Bostic Findley; Chem-Calk 600
2. Pecora Corporation; AC-20+
3. Sonneborn, BASF Building System;Sonolac
4. Tremco Inc.; Tremflex 834
5. May National Bondaflex Sil-A 700

2.5 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting

performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint

sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Sections:
   1. Section 07 24 00 – Exterior Insulation & Finish Systems
   2. Section 07 62 00 – Sheet Metal Flashing & Trim
   3. Section 08 71 00 – Door Hardware - for door hardware for hollow-metal doors.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.

D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.6 QUALITY ASSURANCE

A. Comply with Architectural Barriers Act Accessibility Standards (ABAAS) and DSC Accessibility Requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

B. Doors as listed in the plans, or approved equal.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Standard-Duty Doors and Frames: SDI A250.8, Level 1.

1. Physical Performance: Level C according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches.
   c. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.032 inch.
   d. Edge Construction: Model 2, Seamless.
   e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
3. Frames:
   a. Materials: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
   b. Construction: Full profile welded.
4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Hollow-Metal Doors and Frames: NAAMM-HMMA 860.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum G60 coating.
   d. Edge Construction: Continuously welded with no visible seam.
   e. Core: Steel stiffened.
   f. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than R-19 when tested according to ASTM C 1363.
3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G60 coating.
   b. Construction: Full profile welded.
      1) Thermal-Rated Frames: Provide frames with thermal-resistance value (R-value) of not less than R-19.
4. Exposed Finish: Prime.
5. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.60. Submit proof of compliance by a certified independent laboratory, and labeled by door manufacturer as such with submittal.
6. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G60 coating.
b. Construction: Full profile welded.
1) Thermal-Rated Frames: Provide frames with thermal-resistance value (R-value) of not less than R-19.

7. Exposed Finish: Prime.

2.5 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.6 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M,

Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C476, except with a maximum slump of 4 inches, as measured according to ASTM C 143.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection ratings indicated.
3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
4. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:

        1) Two anchors per jamb up to 60 inches high.
        2) Three anchors per jamb from 60 to 90 inches high.
        3) Four anchors per jamb from 90 to 120 inches high.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

    c. Compression Type: Not less than two anchors in each frame.
    d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.10 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post installed expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with post installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on

parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/16 inch
c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 INSPECTION

A. Inspect finished installation to establish compliance with ABAAS and DSC requirements. Use DSC – CQC Accessibility Inspection Report as basis for recordation. Record observations with confirmation of compliant and noncompliant work. Record observations and supplement with sketches, descriptive data and notes, drawings, measurements, digital images, etc. coordinate inspections with construction schedule and commence inspection immediately after work is finished. Submit report to CO for review and approval. Submit report no more than one day (24 hours) after performing inspection.

3.5 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Electric operated overhead insulated rolling/coiling door.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Operation & Maintenance Data: For overhead coiling doors and operators to include in

maintenance manuals.

B. Standard Warranty: Two (2) years from date of shipment against defects in material and workmanship. Warranty shall cover fame, door, coiling assembly and operator.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10B.

PART 2 - PRODUCTS

2.1 MANUFACTURERS, GENERAL

A. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

1. Design Wind Load: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.

2.3 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.
1. Cookson, Thermiser Model ESD20, or approved equal.

B. Operation Cycles: Door components and operators capable of operating for not less than 50,000 cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

C. Curtain R-Value: Minimum R-value of 8.0 (U-value of 0.125) as calculated using the ASHRAE Handbook of Fundamentals

D. Door Curtain:

1. Fabrication:
   a. Slat Material: Stainless Steel/Galvanized Steel, Minimum 22 gauge AISI type 304 #4 finish stainless steel/24gauge, Grade 40, ASTM A 653 galvanized steel zinc coating
   b. Insulation: 7/8 inch (22 mm) foamed-in-place, closed cell urethane
   c. Total Slat Thickness: 15/16 inch (24 mm)

d. Flame Spread Index of 0 and a Smoke Developed Index of 10 as tested per ASTM E84
e. R-value: 8.0
f. STC Rating: Up to 30 for the curtain and up to 32 for the entire assembly, as tested per ASTM E90 and based on testing a complete, operable assembly

2. Exterior Slat Finish:
   a. Power Coating System: SpectraShield, approved equal (Color Selected by Owner/Engineer):
      1) SpectraShield, or equal, color as selected by Owner/Engineer from manufacturer's color range, more than 180 colors
      2) SpectraShield Ultra, or equal – Ultra Powder Coat to be applied as a protective top coat over SpectraShield finish. Top coat is a polyester based structured wear resistant clear powder coat of 2.5-3.5 mils cured film thickness. ASTM D-3363 pencil hardness: 2H or better. Tested per ASTM B117. Base coating of SpectraShield color as selected by Owner/Engineer from manufacturer's color range, more than 180 colors.
3. Interior Slat Finish:
   a. Powder Coating System: SpectraShield, approved equal (Color Selected by Owner/Engineer):
      1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding baked-on base coat and tan baked-on polyester finish coat
      2) Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Owner/Engineer from manufacturer's standard color range, over 180 colors. minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.

E. Endlocks: Fabricate interlocking sections with high strength galvanized cast iron endlocks on alternate slats each secured with two ¼" (6.35 mm) rivets. Provide windlocks as required to meet specified wind load.
   1. Galvanized cast iron: Required if above 21'-5" width (DBG - Distance Between Guides)

F. Bottom Bar:
   1. Configuration:
      a. Heavy Duty Bottom Bar: 6" x 2" x 3/8" aluminum tubular extrusion configured to withstand 350% more impact than standard bottom bar. (Doors up to 12' wide; interior mounted only).
   2. Finish:
      a. Exterior: Match slats
      b. Interior: Dark bronze anodized

G. Guides:
   1. Fabrication:
      a. Minimum 3/16 inch (4.76 mm) stainless steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load.
   2. Finish:
      a. Stainless Steel: Mill finish

H. Counterbalance Shaft Assembly:
   1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03

inches per foot (2.5 mm per meter) of width

2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque.

I. Brackets:

1. Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures
2. Finish:
   a. SpectraShield Power Coating System, or approved equal (Color Selected by Owner/Engineer): Zirconium treatment followed by baked-on polyester powder coat, [color as selected by Owner/Engineer from manufacturer's standard color range, over 180 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better

J. Hood:

1. Minimum 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets as required to prevent excessive sag.
2. Finish:
   a. SpectraShield Powder Coating System, or equal (Color Selected by Owner/Engineer):
      1) ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat
      2) Zirconium treatment followed by baked-on polyester powder coat, with color as selected by Owner/Engineer from manufacturer's standard color range, over 180 colors; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better.

K. Weatherstripping:

1. Bottom Bar:
   a. Bottom Bar, Motor Operated Doors: Sensing/weather edge with neoprene astragal extending full width of door bottom bar
2. Guides: Replaceable vinyl strip on guides sealing against both sides of curtain
3. Hood: Neoprene/rayon baffle to impede air flow above coil
4. Lintel Seal: Nylon brush seal fitted at door header to impede air flow

2.4 OPERATION

A. Motorized operators shall be selected by the door manufacturer based on door sizes and materials of construction noted in the plans and herein.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Note: Provide explosion proof operator when noted in the plans.

1. Control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc

2. Door Operator Location (s): Motor mounted on the side of coiling door shown in the plans. Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.

C. Motor Operator: The operator must not extend above or below the door coil when mounted front-of-coil. Rated for a maximum of 20 cycles per hour (not to be used for consecutive hours) cULus listed (to comply with UL requirements in The United States and Canada), Totally Enclosed Non-Ventilated gear head operator(s) rated horsepower as recommended by door manufacture for size and type of door, 120 Volts, Single Phase. Provide complete with electric motor and factory pre-wired motor control terminals, maintenance free solenoid actuated brake, emergency manual chain hoist and control station(s). Motor shall be high starting torque, industrial type, protected against overload with an auto-reset thermal sensing device. Primary speed reduction shall be heavy-duty, lubricated gears with mechanical braking to hold the door in any position. Operator shall be equipped with an emergency manual chain hoist assembly that safely cuts operator power when engaged. A disconnect chain shall not be required to engage or release the manual chain hoist. Provide an integral Motor Mounted Interlock system to prevent damage to door and operator when mechanical door locking devices are provided. Operator shall be capable of driving the door at a minimum speed of 8 inches per second. Fully adjustable, driven linear screw type cam limit switch mechanism shall synchronize the operator with the door. The electrical contractor shall mount the control station(s) and supply the appropriate disconnect switch, all conduit and wiring per the overhead door wiring instructions.

D. Control Station: Surface mounted with "Open/Close" key switch with "Stop" push button; NEMA 3R

E. Control Operation:
1. Constant Pressure to Close:
   a. 2-wire, electric sensing edge seal extending full width of door bottom bar. Contact before door fully closes shall cause door to immediately stop downward travel and reverse direction to the fully opened position. Provide a self-coiling cable connection to control circuit.
2. Sensing/Weather Edge: Automatic reversing control by an automatic sensing switch within neoprene or rubber astragal extending full width of door bottom bar.
   a. Electric sensing edge device. Provide a wireless sensing edge connection to motor operator eliminating the need for a physical traveling electric cord connection between bottom bar sensing edge device and motor operator.

2.5 ACCESSORIES

A. Vision Panels: 10 x 1-1/2 x 3/4 inch thick (254 x 38 x 19 mm) oval acrylic panes set with double-sided foam glazing tape and fully contained within slat assembly. Refer to drawings for number and placement. Smaller vision panels are not acceptable.

B. Interior Aesthetic Covers:

C. Operator and Bracket Mechanism Cover: Minimum 24 gauge galvanized steel [0.040 inch sheet metal cover to enclose exposed moving operating components at coil area of unit. Finish to match door hood.

i. Door Operator Location(s): Operator location indicated for each door.

1. Bench Mounted: Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.

ii. Motors: Reversible-type motor with controller (disconnect switch) for motor exposure indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

1. Adjust exterior doors and components to be weather-resistant.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide tight fit around entire perimeter.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION 08 33 23

SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENT

A. Drawings and general provisions of the Contract, including General and supplementary conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes aluminum windows for exterior locations.

B. Related Sections
   1. Section 07 62 00 – Sheet Metal Flashing & Trim

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.

D. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

   1. Match existing if able.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that

meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
      c. Faulty operation of movable sash and hardware.
      d. Deterioration of materials and finishes beyond normal weathering.
      e. Failure of insulating glass.

   2. Warranty Period:

      a. Window: 10 years from date of Substantial Completion.
      b. Glazing Units: 10 years from date of Substantial Completion.
      c. Aluminum Finish: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Windows as listed in the plans, or approved equal.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Custom Window Company.
   2. EFCO Corporation.
   3. Graham Architectural Products Corporation.
   4. Kawneer North America; an Alcoa company.
   5. Mannix.
   6. TRACO.
   7. Wausau Window and Wall Systems; Apogee Wausau Group.

C. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AMMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: AW.
2. Minimum Performance Grade: Minimum for performance class indicated.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.65: Submit proof of compliance by a certified independent laboratory, and labeled by window manufacturer as such with submittal.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC As required by code. Submit proof of compliance with submittals.

E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.

F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F material surfaces.

2.3 ALUMINUM WINDOWS

A. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Fixed.

B. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal- to-metal contact.

C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.

1. Kind: Fully tempered

D. Insulating-Glass Units: ASTM E 2190, certified through IGCC as complying with requirements of IGCC.

1. Glass: ASTM C 1036, Type 1, Class 1, q3.

a. Tint: Clear.
b. Kind: Fully tempered.

2. Lites: Two.
3. Filling: Fill space between glass lites with argon.
4. Low-E Coating: Sputtered on second surface.

E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

1. Dual Glazing:

a. Interior Lite: Glass.
b. Exterior Lite: Insulating-glass unit.

F. Fasteners: Noncorrosive and compatible with window members, trim, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

D. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design wind loads of window units.

E. Complete fabrication, assembly, finishing, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish (Three-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coatings; Organic Coating: manufacturer's standard three-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Owner from full range of industry colors and color densities. Match existing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
2. Air-Infiltration Testing:

    a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:

    a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
    b. Allowable Water Infiltration: No water penetration.

4. Testing Extent: Three windows of each type as selected by Engineer and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
5. Test Reports: Prepared according to AAMA 502.

C. Remove and replace noncomplying windows and retest as specified above.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 08 51 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Mechanical door hardware for the following:
   a. Swinging doors.
2. Thresholds.
3. Weather stripping, seals, and door gaskets

B. Related Sections:
1. Section 08 11 13 - Hollow Metal Doors and Frames

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Other Action Submittals:

1. Door Hardware Schedule: Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   a. Verify with existing doors that door hardware schedule matches or is similar to existing.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.
3. Door Hardware & Keying Schedule to match existing doors.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with the following requirements:

1. NFPA 101
2. NFPA 80
3. NFPA 252

B. Source Limitations: Obtain each type of door hardware from a single manufacturer.

C. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

D. Comply with Architectural Barriers Act Accessibility Standards (ABAAS) and DSC Accessibility Requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

C. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

D. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.8 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Coordinate the work with other directly affected sections involving manufacture or fabrication of internal reinforcement for door hardware.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including excessive deflection, cracking, or breakage.
b. Faulty operation of doors and door hardware.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
   a. Manual Closers: 10 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for owners continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Door Hardware Schedule:

1. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
   1. Manufacturer: McKinney, US32D, TAA3386 4.5x4.5 NRP, or approved equal.

2.3 OPENING MECHANISMS

A. Exit/Interior Device:
   1. Exist device shall consist of panic hardward with panic bar conforming to ANSI/BHMA A156.3, Grade 1
   2. Construction: Stainless
   3. Manufacturers:
      a. Detex Advantex F10 Series with panic rim exit device,
      b. Dorex 9500FR Series with rim exit device,
      c. or approved equal

B. Entry/Exterior Device:
   1. Entry device shall consist of a push-button combination with lever access and key override.
   2. Locking core/cylinder: Provided by Owner
   3. Manufacturers:
      a. Simplex LP1020 complete with trim,
      b. or approved equal

2.5 OPERATING TRIM

A. Operating Trim: BHMA A156.6; stainless, unless otherwise indicated.

2.6 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

B. Manufacturers:
   1. Dorex 1701 Series,
   2. LCN 4040XP
   3. or approved equal.

2.7 THRESHOLDS, SWEEPS & ASTRIGAL

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
   1. Manufacturer: Pemko 171A threshold w/ 315CN sweep, or approved equal.

2.8 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.

2.9 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch throw; designed for mortising into door edge.

2.10 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient, or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
   1. Manufacturer: Pemko, 303AS, or approved equal.

2.11 FABRICATION

A. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

B. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

2.12 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated on Drawings unless otherwise indicated or required to comply with governing regulations.

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Furnish permanent cores to Owner for installation.

E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.5 INSPECTION

A. Inspect finished installation to establish compliance with ABAAS and DSC requirements. Use DSC – CQC Accessibility Inspection Report as basis for recordation. Record observations with confirmation of compliant and noncompliant work. Record observations and supplement with sketches, descriptive data and notes, drawings, measurements, digital images, etc. coordinate inspections with construction schedule and commence inspection immediately after work is finished. Submit report to CO for review and approval. Submit report no more than one day (24 hours) after performing inspection.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Section 01 79 00 "Demonstration and Training."

A. Panic hardware shall be installed on the inside of all exterior Building doors.

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Glass for windows and doors.
2. Glazing sealants and accessories.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of the following products; 12 inches square.

1. Tinted glass.
2. Laminated glass.
3. Insulating glass.

C. Glazing Accessory Samples: For sealants, in 12-inch lengths.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements

and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For glass.

C. Product Test Reports: For tinted glass, insulating glass and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
3. Test no fewer than Two Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F .

1.11 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Window mfg as listed in the plans, or approved equal.

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

1. Obtain tinted glass from single source from single manufacturer.
2. Obtain reflective-coated glass from single source from single manufacturer.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.

1. Design Wind Pressures: As required by code.
2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
    a. Wind Design Data: As indicated on Drawings.
    b. Basic Wind Speed: As indicated on Drawings.
    c. Importance Factor: As indicated on Drawings.
    d. Exposure Category: As indicated on Drawings.
3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
5. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F
3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

D. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.

2. Spacer: Manufacturer's standard spacer material and construction.

2.6 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Engineer from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.7 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.9 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass

from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

END OF SECTION 08 80 00

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Tile backing panels.

B. Related Requirements:

1. Section 06 16 00 "Sheathing" for gypsum sheathing for exterior walls.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Gypsum.
b. National Gypsum Company.
c. PABCO Gypsum.
d. United States Gypsum Company.

2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or ASTM C 1325, with manufacturer's standard edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. C-Cure.
    b. James Hardie Building Products, Inc.
    c. National Gypsum Company.
    d. United States Gypsum Company.

2. Thickness: 5/8 inch.

3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

    a. Cornerbead.
    b. Bullnose bead.
    c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    d. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Fry Reglet Corporation.
    b. Gordon, Inc.
    c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.

3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Exterior Applications:

1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from
0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

2.8 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance- rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.

3. Level 5: Where indicated on Drawings.

a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel and iron.
2. Galvanized metal.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Engineer will select one surface to represent surfaces and conditions for application of each paint system.

    a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
    b. Other Items: Engineer will designate items or areas required.

2. Final approval of color selections will be based on mockups.

    a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Engineer at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As selected by Engineer from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:

1. Water-Based Light Industrial Coating System MPI EXT 5.1N:

a. Prime Coat: Primer, epoxy, anti-corrosive MPI #101.
b. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3), MPI #161.

B. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System MPI EXT 5.3K:

a. Prime Coat: Primer, epoxy, anti-corrosive, MPI #101.
b. Topcoat: Light industrial coating, exterior, water based (MPI Gloss Level 3), MPI #161.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete masonry units (CMUs).
2. Gypsum board.
3. Galvanized metal.

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

2. Indicate VOC content.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Engineer will select one surface to represent surfaces and conditions for application of each paint system.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Engineer at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. Colors: As selected by Engineer from manufacturer's full range PART 3 -

EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Masonry (Clay and CMUs): 12 percent.

2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name,

identification, performance rating, or nomenclature plates.

5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Galvanized-Metal Substrates:

1. Latex System MPI INT 5.3A:

a. Prime Coat: Primer, galvanized, cementitious, MPI #26.
b. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

B. Gypsum Board Substrates:

1. Latex over Latex Sealer System MPI INT 9.2A:

    a. Prime Coat: Latex, interior, matching topcoat.
    b. Topcoat: Latex, interior, flat (MPI Gloss Level 1), MPI #53.

END OF SECTION 09 91 23

SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of high-performance coating systems.

1. Exterior Substrates:

a. Concrete masonry units (CMUs).
b. Steel
c. Galvanized metal.
d. Aluminum (not anodized or otherwise coated).

2. Interior Substrates:

a. Concrete masonry units (CMUs).
b. Steel incl. pipe, fittings, valves & supports
c. Galvanized metal.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for shop painting steel with coatings specified in this Section.
2. Section 09 91 13 "Exterior Painting" for general field painting.
3. Section 09 91 23 "Interior Painting" for general field painting.

1.3 DEFINITIONS

A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 5 percent, but not less than 1 gal.of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Engineer will select one surface to represent surfaces and conditions for application of each coating system.

    a. Wall Surfaces: Provide samples of at least 100 sq. ft.

2. Final approval of color selections will be based on mockups.

    a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Engineer at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Engineer specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Tnemec,
2. Sherwin-Williams Company (the),
3. or equal.

B. Products: Subject to compliance with requirements, provide product listed in the Exterior High-Performance Coating Schedule or Interior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. Colors: As selected by Engineer from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Masonry (Clay and CMUs): 12 percent.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:

   1. SSPC-SP 7/NACE No. 4.
   2. SSPC-SP 11.
   3. SSPC-SP 6/NACE No. 3.
   4. SSPC-SP 10/NACE No. 2.
   5. SSPC-SP 5/NACE No. 1.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by

mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

H. Aluminum Substrates: Remove loose surface oxidation.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual," or as recommended by the paint manufacturer's cut sheet and agreed upon by Engineer.

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and

leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. CMU Substrates:

1. Epoxy System MPI EXT 4.2E:

a. Block Filler: Block filler, epoxy, MPI #116.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, MPI #77.

B. Steel Substrates:

1. Epoxy System MPI EXT 5.1F:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
b. Intermediate Coat: Epoxy, high build, low gloss, MPI #108.
c. Topcoat: Epoxy, gloss, MPI #77.

C. Galvanized-Metal Substrates:

1. Epoxy System MPI EXT 5.3C:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, MPI #77.

D. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Epoxy System MPI EXT 5.4E:

a. Prime Coat: Primer, vinyl wash, MPI #80.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, MPI #77.

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. CMU Substrates:

1. Epoxy System MPI INT 4.2F:

a. Block Filler: Block filler, epoxy, MPI #116.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, MPI #77.

B. Steel Substrates:

1. General: Epoxy System MPI INT 5.1L:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, MPI #77.

C. Galvanized-Metal Substrates:

1. Epoxy over Epoxy Primer System MPI INT 5.3D:

a. Prime Coat: Primer, epoxy, anti-corrosive, for metal, MPI #101.
b. Intermediate Coat: Epoxy, matching topcoat.
c. Topcoat: Epoxy, gloss, MPI #77.

END OF SECTION 09 96 00

SECTION 22 00 00 - GENERAL PROVISIONS FOR PLUMBING WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this section.

1.2 ALTERNATES

A. Take cognizance of any change required in this work which may be a direct result of any alternate bid item listed and include the price deemed necessary to meet the requirements of the respective alternate.

1.3 BIDDING

A. The Contractor shall provide labor, materials, equipment, items, articles, operations and methods listed, shown, scheduled, or mentioned on the drawings, and/or specified, including all incidentals required for their completion.

B. The Contractor shall refer to the General part of these specifications, such as Instructions to Bidders, Special Conditions and DIVISION 1 for restrictions covering time that work can be performed in certain areas, noisy and dusty operations, sequence of work, access to restricted areas and similar types of work and operations.

1.4 SUBSTITUTIONS

A. Most items in this Division are eligible for substitution in accordance with the General Conditions and Supplements thereto. Brand restrictions are limited to building automation systems. Vendors for restricted brands are not limited.

B. When the owner deems it necessary, to assure satisfactory installation and compatibility with other equipment, piping, ductwork, electrical provisions and other appurtenances, the Contractor shall prepare scale drawings of the substitute item showing proposed location, connections, relation to other equipment and other pertinent data such as maintenance space requirements, electrical requirements, height and weight. Drawings must receive owner’s approval before the substitution is made.

C. It is the Contractor's responsibility that the substitute item shall fit into the space allocated and that the item can be installed and function as intended. Should changes in the work of any Contractor become necessary as a result of any substitute item under this Division, such changes shall be arranged and paid for by this Contractor.

D. Capacities of substitute items shall not be less than that of the specified item.

E. The performance of the factory representative and supplier on past work will be a consideration in the approval process of substitute items.

F. The final decision as to acceptability rests with the owner.

1.5 CODES, REGULATIONS AND PERMITS

A. All materials and equipment shall be new, approved by the governing authority, and be in new, undamaged condition when installed.

B. Comply with the currently adopted edition as of the bid date of the International Mechanical Code, National Fire Protection Association Codes and Standards, State of Wyoming Plumbing Code, International Building Code, National Fire Protection Association, and all other applicable Federal, State, County and City codes, regulations and ordinances. Comply with DIVISION 26 and all codes referenced therein for any and all electrical work accomplished under this Division or by this Contractor.

C. Arrange for and obtain all permits and approvals required for the execution of the work.

1.6 INTENT OF DRAWINGS

A. Pipe or duct risers and other diagrams are schematic only and not to scale. They are intended only to indicate sizes or relative arrangement of pipe and equipment shown elsewhere in plan view.

1.7 WORKMANSHIP

A. Work shall be accomplished by workmen skilled in the particular trade, in conformance with best practices and to meet all applicable codes.

B. This Contractor shall replace materials or equipment not properly installed or finished, without increase in payment received.

1.8 RESPONSIBILITY

A. The Contractor is responsible for installation of a satisfactory and complete piece of work in accordance with intent of the drawings and specifications.

B. Consult all drawings for the project to predetermine that the work and equipment will fit as planned.

C. The location of piping, ducts, equipment, etc., shall be checked to ensure clearance from openings, structural members, cabinets, lights, outlets, and equipment having fixed locations. This shall be accomplished prior to fabrication of pipe or ducts.

D. If, at any time, and in any case, changes in location of piping, ducts, equipment, etc., becomes necessary due to existing obstacles or installation of other trades shown on any of the project drawings and such conflict could have been avoided by proper coordination between trades or proper pre-planning of work, such required changes shall be made by the Contractor at no extra cost. These changes are to be recorded on the record drawings.

E. This Contractor is responsible to provide all incidental electrical interconnections, control wiring, etc., which are necessary for system completion and which are not specifically shown

or otherwise indicated on the electrical drawings or specified in DIVISION 26.

F. All electrical work incidental to or accomplished under this Division shall comply with all requirements of DIVISION 26.

1.9 DELIVERY AND STORAGE OF MATERIALS

A. Make provisions which are acceptable to the Owner for delivery and storage of materials.

B. Make provisions for introduction into the building of equipment furnished under this Division.

C. Refer to DIVISION I for additional provisions to allow equipment passage into the building.

1.10 MANUFACTURER'S DIRECTIONS

A. Manufactured materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer unless noted otherwise herein or on the drawings.

B. Certain items of equipment, as noted herein, shall be checked out, started and put into service by factory representatives.

1.11 CUTTING, PATCHING, REPAIRING

A. Cutting, patching and repairing required by the work of this Division shall be the responsibility of this Contractor.

B. Work shall be performed in accordance with DIVISION 1 of these specifications.

C. The performance of this work shall not weaken the structural integrity of the building.

D. Any abrasion or disfigurement of the finished work or any portion of the building where any such abrasion or disfigurement is caused by the activities of the Contractor shall be repaired and neatly refinished to match the adjacent work.

1.12 OPENINGS IN PIPES AND DUCTS

A. Openings in pipes and ducts shall be kept closed during progress of work.

B. The Contractor is required to clean new systems found dirty to the satisfaction of the owner at no additional cost.

1.13 CLEANUP

A. Upon completion of work, remove materials, scraps, etc., relative to this work and leave the premises in a clean and orderly condition. This applies equally to finished, unfinished and concealed spaces.

B. Clean equipment of dirt and debris.

1.14 SAMPLES

A. The Contractor shall submit actual production samples on any material or equipment requested if, in the owner's opinion, it is necessary in order to determine the quality, workmanship, operation, etc. of the item.

B. Samples will be returned to the Contractor. Approved samples may be used on the job.

C. Costs incurred in providing and returning samples will be the responsibility of the Contractor.

1.15 TEMPORARY SERVICES

A. See DIVISION 1 - GENERAL REQUIREMENTS for Temporary Facilities.

1.16 ACCESS DOORS

A. Where access to valves, dampers, equipment, etc. is required, provide Inryco/Milcor Type "K", "DW", or "M" doors. Access doors required in fire-rated walls or ceilings shall be U.L. approved, similar and equal to Ruskin #APW1. Size of door shall be sufficient to provide proper access to item, if size is not listed on the drawings, or approved equal.

1.17 COMPLETION AND TESTS

A. Complete and test each system as specified. Submit all reports. Leave all systems in proper operation.

B. At the time of finalizing the project, a demonstration of all systems shall be performed in the presence of the owner's designated representative. The Contractor shall demonstrate that the systems perform in the manner described in the specifications and indicated on the drawings.

1.18 OPERATING INSTRUCTIONS

A. The Contractor shall provide qualified personnel to instruct the Owner's maintenance personnel in the operation and maintenance of all the new systems and equipment. In general, these instructions may be given by the installer of the system. However, some equipment or systems require instruction be given by an authorized agent of the supplier or manufacturer. See the individual Sections of this Division for specific training requirements.

B. Written operation and maintenance instructions, as produced by the manufacturer, shall be provided for all equipment. These instructions shall be bound and submitted as described in this Section.

1.19 RECORD DRAWINGS

A. A separate set of mechanical drawings shall be maintained at the job site at all times and shall be used as record drawings. This set shall be kept up to date with all changes and/or additions in the construction and/or mechanical systems, and shall be delivered to the owner at the completion of this job. This set of drawings shall be kept clean and protected at all times.

B. Owner will review the drawings periodically as the project progresses.

PART 2 SUBMITTAL PROCEDURES AND OPERATION AND MAINTENANCE DATA

2.1 MANUFACTURERS AND PRODUCTS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified. Other products may be approved by the Architect/Engineer in accordance with Section 01 67 00, Part 2.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified. Other manufacturers may be approved by the Architect/Engineer in accordance with Section 01 67 00, Part 2.

2.2 GENERAL

A. The literature required to be submitted and approved in order to fulfill the requirements of this Division falls into two general categories. These are the "Submittals" and "Operation and Maintenance Data." Refer to Sections 013300 and 017823 respectively for additional requirements.

B. "Submittals" is a general term for informational literature which must be supplied to and approved by the Contractor and the owner prior to installing, receiving, or in some instances, even ordering equipment. The normal required types of submittals include shop drawings, manufacturer's literature, installation and operation instructions (from the manufacturer) and wiring diagrams. System reports, such as start-up reports or balancing reports, and the project completion checklist are two forms of submittals which are required after the equipment has been installed and is operational

C. Operations and Maintenance Data are booklets assembled by the contractor which contain operation, maintenance and repair literature for all equipment installed under the requirements of the project. They will be used by the owner as the primary source of information for operating and maintaining the installed systems. As such, they shall exhibit a professional quality, high degree of clarity and durability which will allow their use throughout the useful life of the installed system.

D. General copies of all returned, approved submittals shall be included in the Brochures of Equipment. These books shall also include complete operation and maintenance literature for each piece of equipment such as may be packaged with the equipment for O&M components. They will be used by the Owner’s personnel as the primary source of information for operating and maintaining the installed systems and as such, they shall exhibit a high degree of clarity, thoroughness and be suitably bound and arranged to be useful and durable throughout the life of the installed systems.

2.3 SUBMITTALS

A. Refer to DIVISION 1 for submittal requirements. Contractor shall submit all information listed in submittal schedule and any additional required information as described in each section of this Division. Submit all data and literature listed on the submittal schedule and any other data or literature required by the individual sections of Division 22.

B. The contractor shall procure manufacturer's literature and/or certified prints for all items of equipment, materials or systems on the job. Shop drawings and literature shall be complete and marked showing name of job, item used, size, dimensions, capacity, rough-in, etc., as required for complete check and installation. Any exceptions of the equipment being furnished from that specified shall be clearly defined. Specific requirements of submittals may be expanded in individual specification sections. Minimum requirements shall include the following:

1. Submit complete product literature, including product limitations. Data shall include equipment dimensions, capacities, performance of equipment at the project altitude.
2. Manufacturer's literature shall include any and all restrictions on the application and installed service limitations of the product.

C. All shop drawings shall be reviewed, approved and stamped by the Contractor before ordering.

1. Submittals for any piece of equipment or system which is a substitute from that specified or of any equipment or system specifically directing owner’s review shall be forwarded to the Owner (as designated) for review. The Contractor shall check submittals for number of copies, adequate identification, correctness and compliance with drawings and specifications and apply his stamp of approval before forwarding the submittal. Submittals shall be revised, changed and/or resubmitted until acceptable and approved.

    a. Approval of submittals and literature by the Engineer shall not relieve the Contractor from responsibility for deviations from drawings or specifications, nor shall it relieve him from responsibility for errors in shop drawings or other submittal literature.
    b. Submit number of copies as required in DIVISION 1for review.
    c. Copies produced on copy machines which are not of a permanent or legible nature will not be accepted for shop drawing submittals. Copies must be legible with all dimensions and other pertinent data clear.
    d. Equipment for no more than one section of specifications shall be included in each submittal. They shall be submitted stapled together or in plastic comb binders for each section. Submittals shall not be bound in three-ring binders.
    e. Submittals will not receive partial approval. They will be either accepted or rejected in their entirety.

D. The following is an index of the Sections of this Division.

Section	Title
220000	General Provisions for Plumbing Work
220513	Common Motor Requirements for Plumbing Equipment
220516	Expansion Fittings and Loops for Plumbing Piping
220517	Sleeves and Sleeve Seals for Plumbing Piping

220523	Valves for Plumbing Piping
220529	Hangers and Supports for Plumbing Piping
220548	Vibration and Seismic Controls for Plumbing Piping and Equipment
220553	Identification for Plumbing Piping and Equipment
220719	Plumbing Piping Insulation
221116	Domestic Water Piping
221119	Domestic Water Piping Specialties
221316	Sanitary Waste and Vent Piping

2.4 OPERATION AND MAINTENANCE DATA

A. The Contractor shall prepare and submit two complete Brochures of Equipment for each building. Each shall contain all required submittal data for the construction materials and each piece of equipment installed under this project. The literature required for submittal purposes shall be expanded to include operation and maintenance literature for each piece of equipment. Maintenance information shall be complete in every respect and shall include parts lists and assembly drawings wherever applicable. Manuals, catalogs, etc., shall be new, as supplied by the factory, and not photocopied. The manuals shall also meet all the requirements of Division 1.

B. All literature shall clearly indicate the equipment it represents and shall be labeled with the equipment identification abbreviation found on the drawings, e.g. EF-1, etc. All information which is not applicable to the particular model and size supplied shall be clearly and neatly crossed out with heavy black marker or other suitable means. This includes dimensional drawings, maintenance information, parts lists, wiring diagrams, etc. Only the information applicable to the particular equipment supplied shall remain and it shall be easy to follow. Booklets not meeting these requirements shall be returned for correction.

C. Binders shall be high quality telescoping post type with slide or lever release, metal hinges, and covered hardboard or rigid plastic covers. Similar to Oxford catalog binder Model No. ESSC6193.

D. Dividers shall be used to separate the literature for equipment supplied under each of the various Sections of this Division. Divider headings shall read the same as the Section title e.g. "224100 PLUMBING FIXTURES."

E. Large size drawings or diagrams shall be folded and placed in heavyweight sheets with pockets.

F. The format of the Brochure shall begin with an index sheet. The dividers for each section shall then progress sequentially. Each section shall contain both submittal and maintenance literature for each product.

G. Authorization for final payment shall not be made prior to final acceptance of the Brochures of Equipment.

H. Submittal of Brochure of Equipment will be required early in the construction schedule.

END OF SECTION 22 00 00

SECTION 22 00 10 - PENETRATION FIRESTOPPING FOR PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.2 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.3 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

A. Only tested firestop systems shall be used in specific locations as follows:

1. Penetrations for the passage of duct, piping, and other mechanical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.
2. Repetitive plumbing penetrations in fire-rated floor assemblies. Penetrations exist for the installation of tubs, showers, aerators and other plumbing fixtures.

1.4 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

1. Section 03 30 00 - Cast-In-Place Concrete
2. Section 04 20 00 - Masonry Work
3. Section 07 84 13 – Penetration Firestopping
4. Section 09 29 00 - Gypsum Drywall Systems

1.5 REFERENCES

A. Test Requirements: ASTM E 814, "Standard Method of Fire Tests of Through Penetration Fire Stops"

B. Test Requirements: UL 1479, “Fire Tests of Through-Penetration Firestops”

C. Underwriters Laboratories (UL) of Northbrook, IL publishes tested systems in their "FIRE RESISTANCE DIRECTORY" that is updated annually.

1. UL Fire Resistance Directory:
   a. Firestop Devices (XHJI)
   b. Fire Resistance Ratings (BXRH)
   c. Through-Penetration Firestop Systems (XHEZ)
   d. Fill, Voids, or Cavity Material (XHHW)
   e. Forming Materials (XHKU)

D. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

E. Inspection Requirements: ASTM E 2174, “Standard Practice for On-site Inspection of Installed Fire Stops.”

F. ASTM E 84, “Standard Test Method for Surface Burning Characteristics of Building Materials.”

G. All major building codes: IBC.

H. NFPA 101 - Life Safety Code

1.06 QUALITY ASSURANCE

I. A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

J. Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

K. Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

L. Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

M. For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

1.6 SUBMITTALS

A. Submit Product Data: Manufacturer’s specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Section 220000 and 013300.

B. Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineering judgment must include both project name and contractor’s name who will install firestop system as described in drawing.

C. Submit material safety data sheets provided with product delivered to job-site.

1.7 INSTALLER QUALIFICATIONS

A. Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer’s products per specified requirements. A manufacturer’s willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

B. Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

C. The work is to be installed by a contractor with at least one of the following qualifications:

FM 4991 Approved Contractor
UL Approved Contractor
Hilti Accredited Fire Stop Specialty Contractor
Other Equivalent Certification

D. Firm with not less than 3 years experience with fire stop installation.

E. Successfully completed not less than 3 comparable scale projects using similar systems.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

D. Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

E. Do not use damaged or expired materials.

1.9 PROJECT CONDITIONS

A. Do not use materials that contain flammable solvents.

B. Scheduling
   1. Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
   2. Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

C. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

D. Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

E. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

PART 2 - PRODUCTS

2.1 FIRESTOPPING - GENERAL

A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

C. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

D. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.

E. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

F. Mold Resistance: Provide penetration firestoppping with mold and mildew resistance rating of 0 as determined by ASTM G21.

2.2 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

1. Hilti, Inc., Tulsa, Oklahoma
800-879-8000
www.us.hilti.com
2. Provide products from the above acceptable manufacturer; equivalent products of other manufacturers will be accepted.

2.3 MATERIALS

A. Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

B. Pre-installed firestop devices for use with noncombustible and combustible pipes (closed and open systems) penetrating concrete floors and/or gypsum walls, the following products are acceptable:

1. Hilti Cast-In Place Firestop Device (CP 680-P)
a. Add Aerator Adaptor when used in conjunction with aerator system.

2. Hilti Tub Box Kit (CP 681) for use with tub installations.
a. Hilti Cast-In Place Firestop Device (CP 680-M) for use with noncombustible penetrants.
b. Hilti Firestop Speed Sleeve (CP 653) for use with cable penetrations.
c. Hilti Firestop Drop-In Device (CFS-DID) for use with noncombustible and combustible penetrants.
d. Hilti Firestop Block (CFS-BL)

C. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
2. Hilti Fire Foam (CP 620)
3. Hilti Flexible Firestop Sealant (CP 606)

D. Sealants or caulking materials for use with sheet metal ducts, the following products are acceptable:

1. Hilti Flexible Firestop Sealant (CP 606)
2. Hilti Intumescent Firestop Sealant (FS-ONE MAX)

E. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)

F. Foams, intumescent sealants, or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:

1. Hilti Intumescent Firestop Sealant (FS-ONE MAX)
2. Hilti Fire Foam (CP 620)
3. Hilti Flexible Firestop Sealant (CP 606)

G. Non-curing, re-penetrable, intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
1. Hilti Firestop Putty Stick (CP 618)
2. Hilti Firestop Plug (CFS-PL)

H. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems), the following products are acceptable:

1. Hilti Firestop Collar (CP 643N)
2. Hilti Firestop Collar (CP 644)
3. Hilti Wrap Strips (CP 648E/648S)

I. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Mortar (CP 637)

2. Hilti Firestop Block (CFS-BL)
3. Hilti Fire Foam (CP 620)
4. Hilti Firestop Board (CP 675T)

J. Non-curing, re-penetrable materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Board (CP 675T)

K. For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected, the following products are acceptable:

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Plug (CFS-PL)

L. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E 814 which is equal to the time rating of construction being penetrated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

1. Verify penetrations are properly sized and in suitable condition for application of materials.
2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
3. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
4. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
5. Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

A. Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

B. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.3 INSTALLATION

A. Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

B. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
3. Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

A. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

B. Keep areas of work accessible until inspection by applicable code authorities.

C. Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, “Standard Practice for On-Site Inspection of Installed Fire Stops” or other recognized standard.

D. Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.5 IDENTIFICATION & DOCUMENTATION

A. The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration location on the entire project.

B. The Documentation Form for through penetrations is to include:

1. A Sequential Location Number
2. The Project Name
3. Date of Installation
4. Detailed description of the penetrations location

5. Tested System or Engineered Judgment Number
6. Type of assembly penetrated
7. A detailed description of the size and type of penetrating item
8. Size of opening
9. Number of sides of assemblies addressed
10. Hourly rating to be achieved
11. Installers Name

C. Copies of these documents are to be provided to the general contractor at the completion of the project.

D. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's Name, address, and phone number.
3. Through-Penetration firestop system designation of applicable testing and inspecting agency.
4. Date of Installation.
5. Through-Penetration firestop system manufacturer's name.
6. Installer's Name.

3.6 ADJUSTING AND CLEANING

A. Remove equipment, materials and debris, leaving area in undamaged, clean condition.

B. Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.7 LABOR USE TO INSTALL FIRESTOP SYSTEMS

A. To ensure complete harmony on the project site, the installation of each scope of work is to be performed jurisdictionally correct per existing trade agreements.

END OF SECTION 22 00 10

SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.
4. Silicone sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. GPT; an EnPro Industries company.

B. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, with plain ends and integral welded waterstop collar.

D. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

E. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. GPT; an EnPro Industries company.

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
4. Pressure Plates: Stainless steel, Type 316.
5. Connecting Bolts and Nuts: Stainless steel, Type 316 of length required to secure pressure plates to sealing elements.

2.3 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 25, Use NT.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 6 inches above finished floor level.

2. Using grout or silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6 Steel pipe sleeves
   b. Piping NPS 6 and Larger: Steel pipe sleeves

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6 Steel pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Steel pipe sleeves with sleeve-seal system .

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

   a. Piping Smaller Than NPS 6 : Steel pipe sleeves with sleeve-seal system .

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

   b. Piping NPS 6 and Larger: Steel pipe sleeves with sleeve-seal system.

      1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

   a. Piping Smaller Than NPS 6 . PVC pipe sleeves .

5. Interior Partitions:

   a. Piping Smaller Than NPS 6: PVC pipe sleeves.

END OF SECTION 22 05 17

SECTION 22 05 23 - VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Bronze gate valves.
4. Bronze swing check valves.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
3. ASME B16.18 for solder-joint connections.
4. ASME B31.9 for building services piping valves.
5. ASME B16.1 for flanges on iron valves.

C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Ball Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Butterfly Valve Actuator Types:

1. Gear Actuator: For valves NPS 8 and larger.
2. Handlever: For valves NPS 6 and smaller.
3. Chainwheel: Device for attachment to gear, handlever, or stem; of size and with chain for mounting height, according to "Valve Installation" Article.

I. Valves in Insulated Piping:

1. Include 2-inch stem extensions for ball valves, butterfly valves, and rising stem gate valves.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

J. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. Brass Ball Valves, One-Piece:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. KITZ Corporation.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One piece.
d. Body Material: Forged brass or bronze.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Brass or stainless steel.
h. Ball: Chrome-plated brass or stainless steel.
i. Port: Reduced.

B. Brass Ball Valves, Two-Piece with Full Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; Conbraco Industries, Inc.

b. FNW; Ferguson Enterprises, Inc.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Red White Valve Corp.
g. Stockham; Crane Energy Flow Solutions.
h. WATTS.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

C. Brass Ball Valves, Two-Piece with Regular Port and Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. FNW; Ferguson Enterprises, Inc.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. WATTS.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Regular.

2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, One-Piece:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. FNW; Ferguson Enterprises, Inc.
    c. NIBCO INC.
    d. WATTS.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 400 psig.
    c. Body Design: One piece.
    d. Body Material: Bronze.
    e. Ends: Threaded.
    f. Seats: PTFE.
    g. Stem: Bronze.
    h. Ball: Chrome-plated brass.
    i. Port: Reduced.

B. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Apollo Valves; Conbraco Industries, Inc.
    b. Crane; Crane Energy Flow Solutions.
    c. FNW; Ferguson Enterprises, Inc.
    d. Hammond Valve.
    e. Milwaukee Valve Company.
    f. NIBCO INC.
    g. WATTS.

2. Description:

    a. Standard: MSS SP-110.
    b. CWP Rating: 600 psig.
    c. Body Design: Two piece.
    d. Body Material: Bronze.
    e. Ends: Threaded and soldered.
    f. Seats: PTFE.
    g. Stem: Bronze or brass.
    h. Ball: Chrome-plated brass.
    i. Port: Full.

C. Bronze Ball Valves, Two-Piece with Regular Port and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. WATTS.

2. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.
i. Port: Regular.

2.4 IRON BUTTERFLY VALVES

A. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. WATTS.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 250 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

B. Iron, Single-Flange Butterfly Valves with Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.

d. NIBCO INC.
e. WATTS.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 250 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated[**or -coated**] ductile iron.

2.5 BRONZE GATE VALVES

A. Bronze Gate Valves, NRS, Lead-Free:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. WATTS.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; lead-free bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

B. Bronze Gate Valves, RS, Lead-Free:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. WATTS.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: Bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: Solid wedge; lead-free bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

2.6 BRONZE SWING CHECK VALVES

A. Bronze Swing Check Valves with Bronze Disc, Class 125, Lead-Free:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Apollo Valves; Conbraco Industries, Inc.
b. Hammond Valve.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. WATTS.

2. Description:

a. Standard: MSS SP-139, NSF Certified.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: Lead-free bronze.
e. Ends: Threaded or soldered. See valve schedule articles.
f. Disc: Bronze.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install swing check valves for proper direction of flow in horizontal position with hinge pin level.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valves, one piece.
3. Bronze ball valve, one piece with bronze trim.
4. Brass ball valves, two-piece with regular port and brass trim.
5. Bronze ball valves, two-piece with regular port and bronze or brass trim.

3.5 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valve, one piece.
3. Bronze ball valve with bronze trim, one piece.
4. Brass ball valves, two-piece with regular port and brass trim.
5. Bronze ball valves, two-piece with regular port and bronze or brass trim.

3.6 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valves, two-piece with full port and brass trim.
3. Bronze ball valves, two-piece with full port and bronze or brass trim.

B. Pipe Larger than NPS 2 :

1. Brass ball valves, two-piece with full port and brass trim.
2. Bronze ball valves, two-piece with full port and bronze or brass trim.
3. Iron gate valves, OS&Y, Class 125 with flanged ends.
4. Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
5. Butterfly Valves: 300 CWP, EPDM seat, EPDM encapsulated ductile iron disc.

END OF SECTION 22 05 23

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Pipe positioning systems.
10. Equipment supports.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
3. Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.2 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show fabrication and installation details and include calculations. for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.
4. Pipe stands.
5. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to "2015 ASME Boiler and Pressure Vessel Code, Section IX."

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of stainless steel

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10, steel pipe hanger except hanger is made of fiberglass-reinforced resin.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless steel

2.4 FIBERGLASS STRUT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings

1. Allied Tube & Conduit.
2. Champion Fiberglass, Inc.
3. Cooper B-Line, Inc.
4. SEASAFE, INC.; a Gibraltar Industries Company.

C. Description: Shop- or field-fabricated pipe-support assembly similar to MFMA-4 for supporting multiple parallel pipes.

1. Channels: Continuous slotted fiberglass channel with inturned lips.
2. Channel Nuts: Fiberglass nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.7 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
3. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.8 PIPE-POSITIONING SYSTEMS

A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.10 MATERIALS

A. Aluminum: ASTM B 221.

B. Carbon Steel: ASTM A 1011/A 1011M.

C. Structural Steel: ASTM A 36/A 36M carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A 240/A 240M.

E. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.

F. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

G. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

H. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

I. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

J. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

K. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

L. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Install lateral bracing with pipe hangers and supports to prevent swaying.

N. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.

O. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

P. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

Q. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 incheslong and 0.048 inchthick.
    b. NPS 4: 12 incheslong and 0.06 inchthick.
    c. NPS 5 and NPS 6: 18 incheslong and 0.06 inchthick.
    d. NPS 8 to NPS 14: 24 incheslong and 0.075 inchthick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inchthick.

5. Pipes NPS 8and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Use thermal hanger-shield inserts for insulated piping and tubing.

G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inchesof insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction occurs.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction occurs.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.

H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24if longer ends are required for riser clamps.

I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inchesfor heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg Fpiping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg Fpiping installations.

J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb
    b. Medium (MSS Type 32): 1500 lb
    c. Heavy (MSS Type 33): 3000 lb

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.

2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.

L. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

M. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

N. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

SECTION 22 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.
12. Snubbers.
13. Restraint channel bracings.
14. Restraint cables.
15. Seismic-restraint accessories.
16. Mechanical anchor bolts.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.
   c. VCM Group.
   d. Vibro-Acoustics.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.

3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Waffle pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.

2.2 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.
c. VCM Group.
d. Vibro-Acoustics.

2. Mounting Plates:

a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded with threaded studs or bolts.
b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.3 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.
c. VCM Group.
d. Vibro-Acoustics.

2. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

a. Housing: Cast-ductile iron or welded steel.
b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.
c. VCM Group.
d. Vibro-Acoustics.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.5 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.
   c. VCM Group.
   d. Vibro-Acoustics.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

   a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
   b. Top housing with attachment and leveling bolt.

2.6 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.
c. VCM Group.
d. Vibro-Acoustics.

2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Top plate with threaded mounting holes and elastomeric pad.
c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.7 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing: .

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.
c. VCM Group.
d. Vibro-Acoustics.

2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with [adjustable snubbers to limit vertical movement.

a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch thick neoprene

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psigon isolation material providing equal isolation in all directions.

2.9 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch thick neoprene

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.10 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.
c. VCM Group.
d. Vibro-Acoustics.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.

3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.11 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kinetics Noise Control, Inc.
b. Mason Industries, Inc.
c. VCM Group.
d. Vibro-Acoustics.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.12 SNUBBERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.
3. VCM Group.
4. Vibro-Acoustics.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch- thick resilient cushion.

2.13 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. B-line, an Eaton business.
2. Hilti, Inc.
3. Unistrut; Part of Atkore International.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.14 RESTRAINT CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Gripple Inc.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. VCM Group.
5. Vibro-Acoustics.

B. Restraint Cables: stainless steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.15 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-line, an Eaton business.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. VCM Group.
5. Vibro-Acoustics.

B. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

C. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

D. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

B. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

C. Equipment Restraints:

1. Install seismic snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

D. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 12 feet o.c., and longitudinal supports a maximum of 12 feet o.c.
3. Brace a change of direction longer than 12 feet

E. Install cables so they do not bend across edges of adjacent equipment or building structure.

F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

I. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 221116 "Domestic Water Piping" for piping flexible connections.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless post-connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.

4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION 22 05 48

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Brimar Industries, Inc.
   b. Seton Identification Products.

2. Material and Thickness: anodized aluminum, 0.032-inchminimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: Black
4. Background Color: White.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inchfor T-bar application and 4 inch by 1-1/2 inch for general application.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inchfor viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances for general application. For T-bar application lettering shall be as is practical for smaller label size. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Brimar Industries, Inc.
   b. Seton Identification Products.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inchthick. Where attached with fasteners labels shall have predrilled holes for attachment hardware.

3. Letter Color: Black
4. Background Color: White.
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inchfor T-bar application and 4 inch by 1-1/2 inch for general application.
7. Minimum Letter Size: 1/4 inchfor name of units if viewing distance is less than 24 inches, 1/2 inchfor viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances for general application. For T-bar application lettering shall

be as is practical for smaller label size. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper, tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brimar Industries, Inc.
2. Seton Identification Products.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

C. Letter Color: Black.

D. Background Color: White

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brimar Industries, Inc.
2. Seton Identification Products.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe (pipe insulation on insulated piping systems) and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: At contractor's option, printed plastic with contact-type, permanent-adhesive backing may be used in conjunction with adhesive, roll-type flow direction arrows installed to overlap both ends of pipe label (to prevent label from peeling off). Flow arrows shall be installed to cover full circumference of pipe (insulation on insulated piping systems) and shall overlap on itself a minimum of 2 inches. Do not use adhesive labels on cast iron or other similarly rough surface types, unless such pipe is insulated.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering on semi-rigid plastic pipe labels to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

2.4 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inchfor access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inchnumbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass beaded chain or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inchesminimum Approximately 4 by 7 inches
2. Fasteners: Brass grommet and wire
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment. In lay-in, T-bar ceiling applications also install equipment labels on the T-bar beneath the equipment adjacent to ceiling tile that will provide best service access to the equipment. Labels on equipment shall be installed using fasteners. Labels on T-bar may be installed using adhesives.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feetalong each run.

B. Pipe Label Color Schedule:

1. Low-Pressure Compressed Air Piping:

   a. Background: Safety blue.
   b. Letter Colors: White.

2. High-Pressure Compressed Air Piping:

   a. Background: Safety blue.
   b. Letter Colors: White.

3. Domestic Water Piping

   a. Background: Safety green.
   b. Letter Colors: White.

4. Non-Potable Water Piping

   a. Background Color: Yellow.
   b. Letter Color: Black.

5. Sanitary Waste and Storm Drainage Piping:

   a. Background Color: Purple.
   b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape: 1-1/2 inchesround

2. Letter Color: Black

3.5 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 22 05 53

SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Sanitary waste piping exposed to freezing conditions.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Block Insulation: ASTM C 552, Type I.
2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Preformed Pipe Insulation with Factory-Applied ASJ-SSL: Comply with ASTM C 552, Type II, Class 2.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory- applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
2. Service Temperature Range: 0 to 180 deg F.
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.7 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.

4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

2.8 SECUREMENTS

A. Bands:

1. Stainless Steel: ASTM A 167 or ASTM A 240, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal or closed seal.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch wide, stainless steel or Monel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.

5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth,

hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable

   insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless- steel or aluminum bands. Select band material

compatible with insulation and jacket.

3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 FINISHES

A. Insulation with ASJ: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three location of straight pipe, three location of threaded fittings, two locations of threaded valves, and two locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold and Hot Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 3/4 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1-1/4 and Larger: Insulation shall be one of the following:

a. Cellular Glass: 1-1/2 inches thick.
b. Flexible Elastomeric: 1 inch thick.
c. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be one of the following:

    a. Flexible Elastomeric: 3/4 inch thick.
    b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION 22 07 19

SECTION 22 11 16 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Ductile-iron pipe and fittings.
3. Galvanized steel pipe and fittings.
4. CPVC piping.
5. PEX tube and fittings.
6. PVC pipe and fittings.
7. PP pipe and fittings.
8. Piping joining materials.
9. Transition fittings.
10. Dielectric fittings.

B. Related Requirements:

1. Section 33 11 13 Public Water Utility Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.3 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.

C. Comply with NSF 61 for potable domestic water piping and components.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1.7 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

C. Comply with NSF 372 for low lead.

2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper Pressure-Seal-Joint Fittings:

1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

H. Copper Push-on-Joint Fittings:

1. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
2. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 GALVANIZED-STEEL PIPE AND FITTINGS

2.5 CPVC PIPING

A. CPVC Pipe: ASTM F 441/F 441M, Schedule 40 and Schedule 80.

1. CPVC Socket Fittings: ASTM F 438 for Schedule 40 and ASTM F 439 for Schedule 80.
2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.

B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.

C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

2.6 PEX TUBE AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. MrPex Systems Inc.
2. Uponor.
3. Viega LLC.
4. Watts Radiant; A WATTS Brand.

B. Tube Material: PEX plastic according to ASTM F 876 and ASTM F 877.

C. Fittings: ASTM F 1807, metal insert and copper crimp rings, ASTM F 1960, cold expansion fittings and reinforcing rings.

D. Fittings: ASSE 1061, push-fit fittings.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. SharkBite.
b. Zurn Industries, LLC.

E. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 876; with plastic or corrosion-resistant-metal valve for each outlet.

2.7 PVC PIPE AND FITTINGS

A. PVC Pipe: ASTM D 1785, Schedule 80.

B. PVC Socket Fittings: ASTM D 2467 for Schedule 80.

C. PVC Schedule 80 Threaded Fittings: ASTM D 2464.

2.8 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.

G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

H. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.9 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Charlotte Pipe and Foundry Company.
   b. Spears Manufacturing Company.

2. Description:
   a. PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
   b. HDPE; Butt weld to threaded brass.
   c. One end with threaded brass insert and one solvent-cement-socket end.

D. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Spears Manufacturing Company.

2. Description:

   a. PVC four-part union.
   b. Brass threaded end.
   c. Solvent-cement-joint plastic end.

d. Rubber O-ring.
e. Union nut.

2.10 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. HART Industrial Unions, LLC.
b. Jomar Valve.
c. Matco-Norca.
d. WATTS.
e. Wilkins.
f. Zurn Industries, LLC.

2. Standard: ASSE 1079.
3. Pressure Rating: 250 psig.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. WATTS.

2. Standard: ASSE 1079.

3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 175 psig.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.

c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Nonconducting materials for field assembly of companion flanges.
3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Matco-Norca.
b. Precision Plumbing Products.
c. Victaulic Company.

2. Standard: IAPMO PS 66.

3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements of Division 31 for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gauges, drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."

G. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install PEX tubing with loop at each change of direction of more than 90 degrees.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

S. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 22 11 19 "Domestic Water Piping Specialties.

T. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

H. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Piping: Join according to ASTM D 2855.

I. Joints for PEX Tubing: Join according to ASTM F 1807 for metal insert and copper crimp ring fittings and ASTM F 1960 for cold expansion fittings and reinforcing rings.

J. Joints for PEX Tubing: Join according to ASSE 1061 for push-fit fittings.

K. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.

2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:
    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6: 12 feet with 3/4-inch rod.
8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.
2. NPS 1-1/4 to NPS 2: 48 inches with 3/8-inch rod.
3. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
4. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
5. NPS 6: 48 inches with 3/4-inch rod.
6. NPS 8: 48 inches with 7/8-inch rod.

J. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.

K. Install vinyl-coated hangers for uninsulated PEX tubing and standard steel hangers for insulated PEX tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.
2. NPS 1-1/4 and Larger: 48 inches. Rod size in accordance with manufacturer's installation instructions.
3. Uponor PEX with PEX-a pipe supports: Spacing and rod sizes in accordance with manufacturer's instructions and code requirements.

L. Install hangers for vertical PEX tubing in accordance with manufacturer's instructions and code requirements.

M. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8: 48 inches with 7/8-inch rod.

N. Install supports for vertical PVC piping every 48 inches.

O. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges or grooved couplers instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Repeat procedures if biological examination shows contamination.
    e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
2. PVC, Schedule 80; socket fittings; and solvent-cemented joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be **one of** the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

2. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.
3. PVC, **Schedule 80**; socket fittings; and solvent-cemented joints.

F. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12, shall be the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

G. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be **one of** the following:

1. Hard or soft copper tube, ASTM B 88, Type K; **wrought-**copper, solder-joint fittings; and brazed joints.
2. PVC, Schedule 80; socket fittings; and solvent-cemented joints.

H. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Hard copper tube, ASTM B 88**,** Type L; wrought-copper, solder-joint fittings; and **soldered** joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. CPVC, **Schedule 80**; socket fittings; and solvent-cemented joints.
4. PEX tube.

    a. Fittings for PEX tube:

        1) ASTM F 1807, metal insert and copper crimp rings.
        2) ASTM F 1960, cold expansion fittings and reinforcing rings.
        3) ASSE 1061, push-fit fittings.

I. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be **one of** the following:

1. Hard copper tube, ASTM B 88, Type L; **wrought** copper, solder-joint fittings; and **soldered** joints.
2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
3. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.
4. CPVC, Schedule 80; socket fittings; and solvent-cemented joints.

J. Aboveground domestic water piping, **NPS 5 to NPS 8**, shall be **one of** the following:

1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and **soldered** joints.
2. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.
3. CPVC, Schedule 80; socket fittings; and solvent-cemented joints.

K. Aboveground, combined domestic water-service and fire-service-main piping, NPS 6 to NPS 12, shall be the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

END OF SECTION 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Pressure reducing valves.
4. Hose bibbs.
5. Drain valves.
6. Water-hammer arresters.
7. Air vents.
8. Water meters.
9. Y Strainers
10. Pressure Gauges

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, non-removable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Zurn Industries, LLC.
    b. Watts; a Watts Water Technologies company.

2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle third of flow range.
5. Size: NPS 1-1/2.
6. Design Flow Rate: 35 gpm.
7. Pressure Loss at Design Flow Rate: 14 psig for sizes NPS 2 and smaller.
8. Body: Bronze for NPS 2 and smaller.
9. End Connections: Threaded for NPS 2 and smaller.
10. Configuration: Designed for horizontal, straight-through flow.
11. Accessories:

    a. Valves NPS 2 and Smaller: 2 each, ball-type with threaded ends on inlet and outlet.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.5 PRESSURE REDUCING VALVES

A. Water Pressure Reducing Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Watts, LF25AUB-Z3-HP,
    b. or approved equal

2. Standard: ASSE 1003 and IAPMO and certified to CSA B356
3. Operation: Downstream pressure adjusting between 75 and 125psi with stainless integral strainer.
4. Size: 1-1/2.
5. Design Flow Rate: 20 gpm.
6. Pressure Loss at Design Flow Rate: 12 psig for sizes
7. Body: Lead Free
8. Adjustment: Stainless steel spring and adjustment screws
9. End Connections: FPT both ends with union on inlet
10. Configuration: Designed for horizontal, straight-through flow.
11. Options:

    a. High Pressure Range: 75 to 125 psi
    b. Gauge Tapping: ¼”

2.6 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral non-removable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Operation for Equipment Rooms: Wheel handle.
10. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.

4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Metal bellows.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.9 AIR VENTS

A. Bolted-Construction Automatic Air Vents:
1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

2.10 WATER METERS

A. Ultrasonic-Type Meter w/ Solid State Metrology
1. Accuracy: 0.25 +/- gpm, sustained accuracy through meter life (20-yrs)
2. Display: Electronic, total (kgal) and instantaneous (gpm)
3. Standards: AWWA C715, NSF/ANSI 61, UL327B
4. Size: 1-inch
5. Normal Operating Range: 0.4 to 55 gpm
6. Connection: MNPT
7. Manufacturer: Neptune Mach 10, or approved equal.

2.11 Y STRAINERS

A. Type: Brass Wye-Pattern Strainer w/ tapped retainer cap and closure plug.
1. Lead-free
2. Connections: FNPT
3. Size: Per Plans
4. Maximum Working Pressure: 300 psi
5. Screen. Flared on upstream end to provided unrestricted flow.
6. Manufacturers: Watts, or approved equal.

2.12 PRESSURE GAUGES

A. Dial Pressure Gauges:
   1. Manufacturer/Model: Bourdon, No-Shok 900 Series, or approved equal.
   2. Pressure Range : 0-150 psi
   3. Materials: Liquid filled w/ impact-resistant ABS and stainless stl. case
   4. Size: 2" or 2.5" dialed face
   5. Connection: ½" NPT (see plans)
   6. Accessories:
      a. Pressure Snubber:
         (1) Manufacturer: No-Shok, or approve equal.
         (2) Connections: MIPT x FIPT.
         (3) Size: ½"
         (4) Body: 316 S.S.
      b. Shutoff/Bleed Valve:
         (1) Manufacturer/Model: No-Shok Series 700, or approve equal.
         (2) Connections: MIPT x FIPT
         (3) Size: ½"

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in location indicated on plan. Comply with authorities having jurisdiction.

   1. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
   2. Do not install bypass piping around backflow preventers.

B. Install water-hammer arresters in water piping according to PDI-WH 201.

C. Install air vents at high points of water piping. Install drain piping and discharge onto floor drain.

3.2 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the Reduced-pressure-principle backflow preventers.

3.3 FIELD QUALITY CONTROL

A. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

END OF SECTION 22 11 19

SECTION 22 13 00 – FIRE-SUPPRESSION SPRINKLER SYSTEM

PART 1

PART 2 GENERAL

2.1 SECTIN INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

2.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 22 13 15 – Fire Protection Piping: Piping and valves.

2.3 REFERENCES

A. NFPA 13 – Installation of Sprinkler System.

2.4 SYSTEM DESCRIPTION

A. System to provide coverage for the entire High School Road (HSR) Pump House ,comprised of generator, control and chlorine rooms.

B. Provide system to NFPA 430 “Code for the Storage of Liquid and Solid Oxidizers”.

C. Design Parameters:

1. Fire Sprinkler System Connection Point: 20-inch dia. DIP transmission pipe

2. Water Supply: Indirect supply from existing ToJ Wells 7, 8 & 9 (1000+/- gpm ea.) and direct supply (to HSR PUMP HOUSE) from new ToJ Wells 9 &
10 (1450 gpm ea.)

3. Water System Normal Operating Pressure: 98 psi

4. Minimum Dynamic System Pressure: 95 psi, well supply including both existing and proposed, varies to maintain system pressure at the fire sprinkler connection point (the 20-inch dia. transmission).

5. Maximum Flow: 2900 gpm (Well 9 & 10 supply)

6. Fire Sprinkler Design assumed Water Sys. Design Flow Capacity & Pressure: 2000 gpm at 95 psi.

2.5 SUBMITTALS

A. Submit under provision of Section 01 33 23 – Submittal Procedures.

B. Preliminary Shop Drawings: Prior to detailed submission, submit preliminary layout of finished ceiling areas indicating only head locations coordinated with ceiling installation.

C. Shop Drawings: Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories. Indicate system controls.

D. Product Data: Provide data on sprinkler heads, valves, and specialties, including manufacturer's catalogue information. Submit performance ratings rough-in details, weights, support requirements, and piping connections.

E. Submit shop drawings, product data, hydraulic calculations to Fire Marshall for approval. Submit proof of approval to Engineer.

F. Samples: Submit four of each style of sprinkler head specified.

G. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds code requirements.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01 77 00 – Closeout Procedures

B. Record actual locations of sprinkler heads and deviations of piping from drawings. Indicate drain and test locations.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 78 23 - Operation and Maintenance Data.

B. Maintenance Data: Include components of system, servicing requirements, Record Drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

1.8 QUALITY ASSURANCE

A. Perform Work in accordance with NFPA 13.

B. Equipment and Components: Bear UL label or marking.

C. Maintain two copies of document on site.

1.9 QUALIFICATIONS

A. Installer: Company specializing in performing work of this Section with minimum three years experience.

B. Design sprinkler system under direct supervision of a Professional Engineer experienced in design of this work.

1.10 REGULATORY REQUIREMENTS

A. Hydraulic Calculations, Product Data, Shop Drawings: Bear stamp of approval of ***Fire Marshall*.**

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and protect products to site under provisions of Section 01 67 00.

B. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.12 EXTRA MATERIALS

A. Furnish under provisions of Section 01 77 00 – Closeout Procedures

B. Provide extra sprinkler heads under provisions of NFPA 13.

C. Provide suitable wrenches for each head type.

PART 2 PRODUCTS

2.1 SPRINKLER HEADS

A. Exposed Area Type:
   1. Type: Standard upright type with guard.
   2. Head Finish: Non corrodible coating.
   3. Fusible Link: Fusible solder link type.

B. Guards: Finish to match sprinkler head.

C. Deflectors: Furnish deflectors to protect electrical control panels.

2.2 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate electrically operated alarms, with pressure retard chamber and variable pressure trim.

B. Flooding Deluge Valve: Gate type valve with rubber faced disc actuated manually.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate work of this Section with other affected work.

3.2 INSTALLATION

A. Install equipment in accordance with manufacturer’s instructions.

B. Provide isolation and double check valve assembly at sprinkler system water source connection.

C. Place piping runs to minimize obstruction to other work.

D. Center heads in one direction only in ceiling with location in other direction variable, dependent upon spacing and coordination with ceiling elements.

E. Flush entire piping system of foreign matter.

F. Hydrostatically test entire system.

G. Require test be witnessed by Engineer.

END OF SECTION 22 13 00

SECTION 22 13 15 - FIRE PROTECTION PIPING

PART 1 -- GENERAL

1.1 WORK OF THIS SECTION

A. The WORK of this Section includes providing pipe materials, fittings, and valves for fire protection systems.

1.2 RELATED SECTIONS

A. The work of the following Section applies to the work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of this WORK.

1. Section 22 13 00 – Fire-Suppression Sprinkler System.

1.3 CODES

A. The WORK of this Section shall comply with the current editions of the following codes:

1. National Fire Protection Association
2. International Fire Code
3. National Electrical Code

1.4 SPECIFICATIONS AND STANDARDS

A. Except as otherwise indicated, the current editions of the following apply to the work of this Section:

1.	ANSI/ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800
2.	ANSI/ASME B16.3	Malleable Iron Threaded Fittings, Class 150 and 300
3.	ANSI/ASME B16.4	Cast Iron Threaded Fittings, Class 125 and 250
4.	ANSI/ASME B16.5	Pipe Flanges and Flanged Fittings
5.	ANSI/ASME B16.9	Factory-made Wrought Steel Buttwelding Fittings
6.	ANSI/ASME B16.11	Forged Steel Fittings, Socket-welding and Threading
7.	ANSI/ASME B16.18	Cast Copper Alloy Solder-Joint Pressure Fittings
8.	ANSI/ASME B16.22	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
9.	ANSI/ASME B16.25	Buttwelding Ends

10.	ANSI/ASME B36.10	Welded and Seamless Wrought Steel Pipe
11.	ANSI/ASME Section 9	Welding and Brazing Qualifications
12.	ANSI/ASME A135	Electric-Resistance-Welded Steel Pipe
13.	ANSI/ASTM A47	Malleable Iron Castings
14.	ANSI/ASTM B32	Solder Metal
15.	ANSI/AWS A5.8	Brazing Filler Metal
16.	ANSI/AWWA C110	Ductile Iron and Gray Iron Fittings
17.	ANSI/AWWA C151	Ductile Iron Pipe, Centrifugally Cast
18.	ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless
19.	ASTM A120	Pipe, Steel, Black and Hot-Dipped, Zinc-coated (Galvanized) Welded and Seamless, for Ordinary Uses
20.	ASTM A234	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
21.	ASTM B75	Seamless Copper Tube
22.	ASTM B88	Seamless Copper Water Tube
23.	ASTM B251	General Requirements for Wrought Seamless Copper and Copper-Alloy Tube
24.	AWS D10.9	Specifications for Qualification of Welding Procedures and Welders for Piping and Tubing
25.	NFPA 13	Installation of Sprinkler Systems
26.	NFPA 14	Standpipe and Hose Systems

1.5 SHOP DRAWINGS AND SAMPLES

A. The following shall be submitted in compliance with Section 01 33 23 – Submittal Procedures.

1. Shop drawings indicating pipe materials used, jointing methods, supports, and floor and wall penetration seals.

2. Valve data and ratings.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.

B. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

C. Coating: Temporary protective coating shall be provided on cast iron and steel valves.

PART 2 -- PRODUCTS

2.1 GENERAL: Valves shall bear UL label or marking and shall include manufacturer's name and pressure rating marked on valve body.

2.2 PIPE AND TUBE

A. Pipe and tube shall comply with the following:

1. Steel Pipe: ASTM A53 & A795, Type E, Grade A, black, Schedule 40

2. Copper Tube: ASTM B42, Schedule 40.

2.3 PIPE FITTINGS

A. Pipe fittings shall comply with the following:

1. Steel Fittings: ASTM A234, wrought carbon steel and alloy steel. ANSI/ASME B16.5, steel flanges and fittings. ANSI/ASME B16.11, forged steel socket welded and threaded.

2. Copper Fittings: ANSI/ASME B16.18, cast bronze, solder joint, or ANSI/ASME B16.22, wrought copper and bronze, solder joint, pressure type.

2.4 JOINT MATERIAL

A. Joint materials shall comply with the following:

1. Solder: ANSI/ASTM B32, 95/5 alloy.

2. Brazing: ANSI/AWS A5.8.

2.5 UNIONS, FLANGES, AND COUPLINGS

A. Unions, flanges and couplings shall comply with the following:

1. Unions: 150 psi malleable iron for threaded ferrous piping.

2. Flanges: 150 psi forged steel slip-on flanges for ferrous piping.

3. Mechanical Grooved Couplings: Malleable iron housing clamps designed to engage and lock and to permit angular deflection, contraction, and expansion; "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.

B. Pipe and appurtenances shall be supported in accordance with Section 22-11-16.

2.6 GATE VALVES

A. Gate valves shall comply with the following:

1. Bronze, rising stem, inside screw, solid wedge.

2.7 GLOBE VALVES

A. Globe (or angle) valves shall comply with the following:

1. Bronze, rising stem, inside screw, renewable composition disc.

2.8 CHECK VALVES

A. Check valves shall comply with the following:

1. Bronze, swing disc.

2.9 DRAIN VALVES

A. Drain valves shall comply with the following:

1. Bronze compression stop with nipple and cap or hose thread.

2. Brass ball valve with cap and chain 3/4 inch hose thread.

2.10 VALVE OPERATORS

A. Valve operators shall comply with the following:

1. For gate, globe or angle, and drain valves: handwheel.

2.11 VALVE CONNECTIONS

A. Valve connections shall comply with the following:

1. Valve connections shall match pipe joints and pipe sizes.

2. For copper tube, threaded solder adapters shall be provided for connection to valve.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. Products shall be installed in accordance with the manufacturer's written installation instructions.

3.2 PREPARATION

A. Pipe and tube ends shall be reamed to full inside diameter.

B. Burrs shall be removed and plain ferrous pipe shall be beveled.

C. Scale and foreign material, inside and outside, shall be removed before assembly.

3.3 INSTALLATION - PIPE

A. Screw joint steel piping shall be installed up to and including 1-1/2 inch diameter; screw or weld 2 inch diameter piping; weld piping 2-1/2 diameter and larger, including branch connections.

B. Screw joints shall be die-cut with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

C. Threaded ends shall be coated with pipe lubricant compound.

D. Copper tubes shall be soldered.

E. Piping shall be installed in accordance with NFPA 13 for sprinkler systems.

F. Building structural members shall not be penetrated unless indicated.

G. Sleeves shall be installed when penetrating footings floors and walls.

H. Pipe and sleeve penetrations shall be scaled to achieve fire resistance equivalent to fire separation required.

3.4 INSTALLATION - VALVES

A. Valves shall be installed with stems upright or horizontal, not inverted.

B. Gate valves shall be installed for shut-off or isolating service.

C. Drain valves shall be installed at main shut-off valves, low points of piping and apparatus.

END OF SECTION 22 13 15

SECTION 22 13 16 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Sanitary waste and vent piping and fittings within the building footprint and extending five (5) feet from the building foundation, including cleanout, shall be Schedule 40 PVC. Pipe extending downstream of the cleanout to connection at the sewer main shall be fused seamless pressure pipe comprised of DR 11 PE4710, or PVC Pressure Pipe described herein.

B. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Galvanized steel pipe and fittings.
4. Copper tube and fittings.
5. ABS pipe and fittings.
6. PVC pipe and fittings.
7. HDPE Pipe
8. PVC Pressure Pipe
9. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service class.

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. ANACO-Husky; Standard Series

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Heavy-Duty, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ANACO-Husky; 4000 Series

2. Standards: ASTM C 1277 and ASTM C 1540.
3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.5 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe: ASTM A 53/A 53M, Type E, Standard Weight class. Include square-cut-grooved or threaded ends matching joining method.

B. Steel Pipe Pressure Fittings:

1. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Schedule 40, seamless steel pipe. Include ends matching joining method.
2. Malleable-Iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
3. Galvanized-Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, standard pattern.

C. Cast-Iron Flanges: ASME B16.1, Class 125.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

D. Grooved-Joint, Galvanized-Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Anvil International; a subsidiary of Mueller Water Products, Inc.
    b. Grinnell Mechanical Products.
    c. Shurjoint Piping Products.
    d. Victaulic Company.

2. Galvanized, Grooved-End Fittings for Galvanized-Steel Piping: ASTM A 536 ductile-iron castings, ASTM A 47/A 47M malleable-iron castings, ASTM A 234/A 234M forged steel fittings, or ASTM A 106/A 106M steel pipes with dimensions matching ASTM A 53/A 53M steel pipe, and complying with AWWA C606 for grooved ends.
3. Grooved Mechanical Couplings for Galvanized-Steel Piping: ASTM F 1476, Type I. Include ferrous housing sections with continuous curved keys; EPDM-rubber gasket suitable for hot and cold water; and bolts and nuts.

2.6 COPPER TUBE AND FITTINGS

A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

D. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.7 ABS PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall ABS Pipe: ASTM D 2661, Schedule 40.

C. ABS Socket Fittings: ASTM D 2661, made to ASTM D 3311, drain, waste, and vent patterns.

D. Solvent Cement: ASTM D 2235.

1. Solvent cement shall have a VOC content of 325 g/L or less.
2. Solvent cement shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.8 PVC PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

1. Adhesive primer shall have a VOC content of 550 g/L or less.
2. Adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. Solvent Cement: ASTM D 2564.

1. Solvent cement shall have a VOC content of 510 g/L or less.

2.9 HDPE PIPE

A. Minimum cell class of 445474C in accordance with ASTM D 3350 latest edition, with a Material Designation Code of PE 4710 I.A.W. ASTM F 412, DR 17 PR 125, IPS diameter.

B. Fittings: HDPE, molded or fabricated, certified by the manufacturer as having an allowable pressure rating equal to or greater than the pipe PR while maintaining a 2:1 safety factor. Fittings shall have mitered ends to match adjoining pipe ID.

2.10 PVC PRESSURE PIPE

A. Bell and gasket joint pipe SDR 26 PVC, PR 160 psi conforming to ASTM 2241.

2.11 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2. Shielded, Nonpressure Transition Couplings:

a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:

1) Anaco-Husky; Husky 2000 Series.

2) Fernco RC 5000 Strong Back

b. Standard: ASTM C 1460.

c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

d. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

a. Straight tees, elbows, and crosses may be used on vent lines.

3. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

L. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Verify elevations at connection points (if any) and distances and establish pipe slope at the direction of the Engineer.

2. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger. For piping NPS 3 and larger, the slope may be reduced to 1 percent where allowed by local plumbing codes where invert of sewer main prohibits 2 percent slope.
3. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow. Piping NPS 3 and larger, where structural conditions prohibit a 2 percent slope, the slope may be reduced to 1 percent where allowed by local plumbing codes.
4. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Install aboveground ABS piping according to ASTM D 2661.

Q. Install aboveground PVC piping according to ASTM D 2665.

R. Install underground ABS and PVC piping according to ASTM D 2321.

S. Install and fuse HDPE pipe to the pipe and fitting manufacturer’s recommendations, as well as the requirements of the Handbook of Polyethylene Pipe, Second Edition, PPI.

T. PVC Pressure Pipe (gasketed):
1. Clean and dry the interior of the gasket bell and the exterior of the pipe spigot.
2. Apply lubricant to the spigot end of the pipe. Lubricate up to the insertion depth ring. Do not lubricate the gasket.
3. Insert the spigot end into the gasket bell, making sure the two lengths are aligned. Push the pipes together until the spigot depth ring is flush with the entrance of the bell.
4. Precautions:
    a. Be sure to keep dirt off lubricated spigot and out of the gasket bell.

b. The pipe should be buried at least 24 inches below grade, and at grades established in the plans or by Engineer.
c. Installation, trenching, and backfilling should be performed in accordance with ASTM D2774, and Division 31 – "Earthwork".
d. Complete pressure testing prior to backfill as directed by Engineer. Pipe shall be adequately anchored to prevent movement. The joints and fittings shall remain exposed to facilitate inspection for joint leakage.

U. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping.

a. Comply with requirements for backwater valves specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

a. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

3. Install drains in sanitary waste gravity-flow piping.

a. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

V. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

W. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

X. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

Y. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

D. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

E. Plastic, Non-pressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Shielded, non-pressure transition couplings.

3.5 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
6. Comply with requirements for backwater valves, cleanouts, and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
7. Equipment: Connect waste piping as indicated.

    a. Provide shutoff valve if indicated and union for each connection.
    b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.6 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

    a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

    a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
    b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed ABS and PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

E. Repair damage to adjacent materials caused by waste and vent piping installation.

END OF SECTION 22 13 16

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Floor drains.
3. In-line floor drain trap seals.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1.4 SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Metal Floor Cleanouts:

1. ASME A112.3.1, Stainless-Steel Cleanouts:
    a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
        1) Zurn Industries, LLC.
        2) Josam Company.
        3) Sioux Chief Manufacturing Company, Inc.
        4) Watts; a Watts Water Technologies Company.
2. Size: Same as connected branch.
3. Type: Threaded, adjustable housing.
4. Body or Ferrule: Gray iron.
5. Clamping Device: Required.
6. Outlet Connection: Inside calk.
7. Closure: Cast-iron plug with set screws.
8. Adjustable Housing Material: Cast iron with threads.
9. Frame and Cover Material and Finish: Painted cast iron.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    a. Zurn Industries, LLC.
    b. Josam Company.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Watts; a Watts Water Technologies Company.
2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Trap Sealer: Required
7. Anchor Flange: Required.
8. Clamping Device: Required.
9. Outlet: Bottom.
10. Backwater Valve: Not required.
11. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
12. Sediment Bucket: Required
13. Top or Strainer Material: Gray iron.
14. Top of Body and Strainer Finish: Nickel bronze.
15. Top Shape: Round.
16. Dimensions of Top or Strainer: See plans
17. Top Loading Classification: Extra Heavy-Duty.

18. Funnel: Not required.

2.3 IN-LINE FLOOR DRAIN TRAP SEALERS

A. Pre-assembled ABS housing and neoprene rubber diaphragm with sealing gaskets for insertion into each floor drain and shower drain to seal drain from gasses backing up.

B. Sealers shall meet ASSE 1072 and IPC 709.1.

C. Tested to withstand common cleaning chemicals.

D. Sized for each individual floor drain.

PART 3 - EXECUTION

3.1 INSTALLATION

A. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

B. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1- inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

C. Install floor-drain, in-line trap-seal on inlet to every floor drain and shower drain. Size the same as floor drain inlet.

3.2 CONNECTIONS

A. Comply with requirements in Section 22 13 16 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 23 00 00 - GENERAL PROVISIONS FOR HVAC WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this section.

1.2 ALTERNATES

A. Take cognizance of any change required in this work which may be a direct result of any alternate bid item listed and include the price deemed necessary to meet the requirements of the respective alternate.

1.3 BIDDING

A. The Contractor shall provide labor, materials, equipment, items, articles, operations and methods listed, shown, scheduled, or mentioned on the drawings, and/or specified, including all incidentals required for their completion.

B. The Contractor shall refer to the General part of these specifications, such as Instructions to Bidders, Special Conditions and DIVISION 1 for restrictions covering time that work can be performed in certain areas, noisy and dusty operations, sequence of work, access to restricted areas and similar types of work and operations.

1.4 SUBSTITUTIONS

A. Most items in this Division are eligible for substitution in accordance with the General Conditions and Supplements thereto. Brand restrictions are limited to building automation systems. Vendors for restricted brands are not limited.

B. When the owner deems it necessary, to assure satisfactory installation and compatibility with other equipment, piping, ductwork, electrical provisions and other appurtenances, the Contractor shall prepare scale drawings of the substitute item showing proposed location, connections, relation to other equipment and other pertinent data such as maintenance space requirements, electrical requirements, height and weight. Drawings must receive owner’s approval before the substitution is made.

C. It is the Contractor's responsibility that the substitute item shall fit into the space allocated and that the item can be installed and function as intended. Should changes in the work of any Contractor become necessary as a result of any substitute item under this Division, such changes shall be arranged and paid for by this Contractor.

D. Capacities of substitute items shall not be less than that of the specified item.

E. The performance of the factory representative and supplier on past work will be a consideration in the approval process of substitute items.

F. The final decision as to acceptability rests with the owner.

1.5 CODES, REGULATIONS AND PERMITS

A. All materials and equipment shall be new, approved by the governing authority, and be in new, undamaged condition when installed.

B. Comply with the currently adopted edition as of the bid date of the International Mechanical Code, National Fire Protection Association Codes and Standards, State of Montana Plumbing Code, International Building Code, National Fire Protection Association, and all other applicable Federal, State, County and City codes, regulations and ordinances. Comply with DIVISION 26 and all codes referenced therein for any and all electrical work accomplished under this Division or by this Contractor.

C. Arrange for and obtain all permits and approvals required for the execution of the work.

1.6 INTENT OF DRAWINGS

A. Pipe or duct risers and other diagrams are schematic only and not to scale. They are intended only to indicate sizes or relative arrangement of pipe and equipment shown elsewhere in plan view.

1.7 WORKMANSHIP

A. Work shall be accomplished by workmen skilled in the particular trade, in conformance with best practices and to meet all applicable codes.

B. This Contractor shall replace materials or equipment not properly installed or finished, without increase in payment received.

1.8 RESPONSIBILITY

A. The Contractor is responsible for installation of a satisfactory and complete piece of work in accordance with intent of the drawings and specifications.

B. Consult all drawings for the project to predetermine that the work and equipment will fit as planned.

C. The location of piping, ducts, equipment, etc., shall be checked to ensure clearance from openings, structural members, cabinets, lights, outlets, and equipment having fixed locations. This shall be accomplished prior to fabrication of pipe or ducts.

D. If, at any time, and in any case, changes in location of piping, ducts, equipment, etc., becomes necessary due to existing obstacles or installation of other trades shown on any of the project drawings and such conflict could have been avoided by proper coordination between trades or proper pre-planning of work, such required changes shall be made by the

Contractor at no extra cost. These changes are to be recorded on the record drawings.

E. This Contractor is responsible to provide all incidental electrical interconnections, control wiring, etc., which are necessary for system completion and which are not specifically shown or otherwise indicated on the electrical drawings or specified in DIVISION 26.

F. All electrical work incidental to or accomplished under this Division shall comply with all requirements of DIVISION 26.

1.9 DELIVERY AND STORAGE OF MATERIALS

A. Make provisions which are acceptable to the Owner for delivery and storage of materials.

B. Make provisions for introduction into the building of equipment furnished under this Division.

C. Refer to DIVISION I for additional provisions to allow equipment passage into the building.

1.10 MANUFACTURER'S DIRECTIONS

A. Manufactured materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer unless noted otherwise herein or on the drawings.

B. Certain items of equipment, as noted herein, shall be checked out, started and put into service by factory representatives.

1.11 CUTTING, PATCHING, REPAIRING

A. Cutting, patching and repairing required by the work of this Division shall be the responsibility of this Contractor.

B. Work shall be performed in accordance with DIVISION 1 of these specifications.

C. The performance of this work shall not weaken the structural integrity of the building.

D. Any abrasion or disfigurement of the finished work or any portion of the building where any such abrasion or disfigurement is caused by the activities of the Contractor shall be repaired and neatly refinished to match the adjacent work.

1.12 OPENINGS IN PIPES AND DUCTS

A. Openings in pipes and ducts shall be kept closed during progress of work.

B. The Contractor is required to clean new systems found dirty to the satisfaction of the owner at no additional cost.

1.13 CLEANUP

A. Upon completion of work, remove materials, scraps, etc., relative to this work and leave the

premises in a clean and orderly condition. This applies equally to finished, unfinished and concealed spaces.

B. Clean equipment of dirt and debris.

1.14 SAMPLES

A. The Contractor shall submit actual production samples on any material or equipment requested if, in the owner's opinion, it is necessary in order to determine the quality, workmanship, operation, etc. of the item.

B. Samples will be returned to the Contractor. Approved samples may be used on the job.

C. Costs incurred in providing and returning samples will be the responsibility of the Contractor.

1.15 TEMPORARY SERVICES

A. See DIVISION 1 - GENERAL REQUIREMENTS for Temporary Facilities.

1.16 ACCESS DOORS

A. Where access to valves, dampers, equipment, etc. is required, provide Inryco/Milcor Type "K", "DW", or "M" doors. Access doors required in fire-rated walls or ceilings shall be U.L. approved, similar and equal to Ruskin #APW1. Size of door shall be sufficient to provide proper access to item, if size is not listed on the drawings, or approved equal.

1.17 COMPLETION AND TESTS

A. Complete and test each system as specified. Submit all reports. Leave all systems in proper operation.

B. At the time of finalizing the project, a demonstration of all systems shall be performed in the presence of the owner's designated representative. The Contractor shall demonstrate that the systems perform in the manner described in the specifications and indicated on the drawings.

1.18 OPERATING INSTRUCTIONS

A. The Contractor shall provide qualified personnel to instruct the Owner's maintenance personnel in the operation and maintenance of all the new systems and equipment. In general, these instructions may be given by the installer of the system. However, some equipment or systems require instruction be given by an authorized agent of the supplier or manufacturer. See the individual Sections of this Division for specific training requirements.

B. Written operation and maintenance instructions, as produced by the manufacturer, shall be provided for all equipment. These instructions shall be bound and submitted as described in this Section.

1.19 RECORD DRAWINGS

A. A separate set of mechanical drawings shall be maintained at the job site at all times and shall be used as record drawings. This set shall be kept up to date with all changes and/or additions in the construction and/or mechanical systems, and shall be delivered to the owner at the completion of this job. This set of drawings shall be kept clean and protected at all times.

B. Owner will review the drawings periodically as the project progresses.

PART 2 SUBMITTAL PROCEDURES AND OPERATION AND MAINTENANCE DATA

2.1 MANUFACTURERS AND PRODUCTS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified. Other products may be approved by the Architect/Engineer in accordance with Section 01 67 00, Part 2.
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified. Other manufacturers may be approved by the Architect/Engineer in accordance with Section 01 67 00, Part 2.

2.2 GENERAL

A. The literature required to be submitted and approved in order to fulfill the requirements of this Division falls into two general categories. These are the "Submittals" and "Operation and Maintenance Data." Refer to Sections 01 33 00 and 01 78 23 respectively for additionalrequirements.

B. "Submittals" is a general term for informational literature which must be supplied to and approved by the Contractor and the owner prior to installing, receiving, or in some instances, even ordering equipment. The normal required types of submittals include shop drawings, manufacturer's literature, installation and operation instructions (from the manufacturer) and wiring diagrams. System reports, such as start-up reports or balancing reports, and the project completion checklist are two forms of submittals which are required after the equipment has been installed and is operational

C. Operations and Maintenance Data are booklets assembled by the contractor which contain operation, maintenance and repair literature for all equipment installed under the requirements of the project. They will be used by the owner as the primary source of information for operating and maintaining the installed systems. As such, they shall exhibit a professional quality, high degree of clarity and durability which will allow their use throughout the useful life of the installed system.

D. General copies of all returned, approved submittals shall be included in the Brochures of Equipment. These books shall also include complete operation and maintenance literature for each piece of equipment such as may be packaged with the equipment for O&M

components. They will be used by the Owner's personnel as the primary source of information for operating and maintaining the installed systems and as such, they shall exhibit a high degree of clarity, thoroughness and be suitably bound and arranged to be useful and durable throughout the life of the installed systems.

2.3 SUBMITTALS

A. Refer to DIVISION 1 for submittal requirements. Contractor shall submit all information listed in submittal schedule and any additional required information as described in each section of this Division. Submit all data and literature listed on the submittal schedule and any other data or literature required by the individual sections of Division 23.

B. The contractor shall procure manufacturer's literature and/or certified prints for all items of equipment, materials or systems on the job. Shop drawings and literature shall be complete and marked showing name of job, item used, size, dimensions, capacity, rough-in, etc., as required for complete check and installation. Any exceptions of the equipment being furnished from that specified shall be clearly defined. Specific requirements of submittals may be expanded in individual specification sections. Minimum requirements shall include the following:

1. Submit complete product literature, including product limitations. Data shall include equipment dimensions, capacities, performance of equipment at the project altitude.
2. Manufacturer's literature shall include any and all restrictions on the application and installed service limitations of the product.

C. All shop drawings shall be reviewed, approved and stamped by the Contractor before ordering.

1. Submittals for any piece of equipment or system which is a substitute from that specified or of any equipment or system specifically directing owner's review shall be forwarded to the Owner (as designated) for review. The Contractor shall check submittals for number of copies, adequate identification, correctness and compliance with drawings and specifications and apply his stamp of approval before forwarding the submittal. Submittals shall be revised, changed and/or resubmitted until acceptable and approved.

    a. Approval of submittals and literature by the Engineer shall not relieve the Contractor from responsibility for deviations from drawings or specifications, nor shall it relieve him from responsibility for errors in shop drawings or other submittal literature.
    b. Submit number of copies as required in DIVISION 1for review.
    c. Copies produced on copy machines which are not of a permanent or legible nature will not be accepted for shop drawing submittals. Copies must be legible with all dimensions and other pertinent data clear.
    d. Equipment for no more than one section of specifications shall be included in each submittal. They shall be submitted stapled together or in plastic comb binders for each section. Submittals shall not be bound in three-ring binders.
    e. Submittals will not receive partial approval. They will be either accepted or rejected in their entirety.

D. The following is an index of the Sections of this Division.

Section Title
23 00 00 - General Provisions for HVAC Work
23 051 3 - Common Motor Requirements for HVAC Equipment
23 05 29 - Hangers and Supports for HVAC Piping and Equipment
23 05 48 - Vibration and Seismic Controls for HVAC
23 05 53 - Identification for HVAC Piping and Equipment
23 05 93 - Testing, Adjusting, and Balancing for HVAC
23 07 13 - Duct Insulation
23 08 00 - Commissioning of HVAC
23 23 00 - Refrigerant Piping
23 31 13 - Metal Ducts
23 31 16 - Nonmetal Ducts
23 33 00 - Air Duct Accessories
23 34 23 - HVAC Power Ventilators
23 81 26 - Split-System Air-Conditioners
23 821 9 - Fan Coil Units
23 82 39 - Wall and Ceiling Unit Heaters

2.4 OPERATION AND MAINTENANCE DATA

A. The Contractor shall prepare and submit two complete Brochures of Equipment for each building. Each shall contain all required submittal data for the construction materials and each piece of equipment installed under this project. The literature required for submittal purposes shall be expanded to include operation and maintenance literature for each piece of equipment. Maintenance information shall be complete in every respect and shall include parts lists and assembly drawings wherever applicable. Manuals, catalogs, etc., shall be new, as supplied by the factory, and not photocopied. The manuals shall also meet all the requirements of Division 1.

B. All literature shall clearly indicate the equipment it represents and shall be labeled with the equipment identification abbreviation found on the drawings, e.g. EF-1, etc. All information which is not applicable to the particular model and size supplied shall be clearly and neatly crossed out with heavy black marker or other suitable means. This includes dimensional drawings, maintenance information, parts lists, wiring diagrams, etc. Only the information applicable to the particular equipment supplied shall remain and it shall be easy to follow. Booklets not meeting these requirements shall be returned for correction.

C. Binders shall be high quality telescoping post type with slide or lever release, metal hinges, and covered hardboard or rigid plastic covers. Similar to Oxford catalog binder Model No. ESSC6193.

D. Dividers shall be used to separate the literature for equipment supplied under each of the various Sections of this Division. Divider headings shall read the same as the Section title e.g. "235216 CONDENSING BOILERS."

E. Large size drawings or diagrams shall be folded and placed in heavyweight sheets with

pockets.

F. The format of the Brochure shall begin with an index sheet. The dividers for each section shall then progress sequentially. Each section shall contain both submittal and maintenance literature for each product.

G. Authorization for final payment shall not be made prior to final acceptance of the Brochures of Equipment.

H. Submittal of Brochure of Equipment will be required early in the construction schedule.

END OF SECTION 23 00 00

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 6600 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

I. Enclosure Material: Cast iron for motor frame sizes **324T** and larger; rolled steel for motor frame sizes smaller than **324T**.

2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

END OF SECTION 23 05 13

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.

B. Related Requirements:

1. Section 05 50 00 "Metal Fabrications" for structural-steel shapes and plates for trapezehangers for pipe and equipment supports.
2. Section 23 05 16 "Expansion Fittings and Loops for HVAC Piping" for pipe guides andanchors.
3. Section 23 05 48 "Vibration and Seismic Controls for HVAC" for vibration isolationdevices.
4. Section 23 31 13 "Metal Ducts" and Section 23 31 16 "Nonmetal Ducts" for duct hangersand supports.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.

C. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Fiberglass strut systems.

4. Pipe stands.
5. Equipment supports.

D. Delegated-Design Submittal: For trapeze hangers and equipment supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Include design calculations for designing trapeze hangers.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00"Quality Requirements," to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.2 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated, or epoxy powder-coated.

4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of electro-galvanized steel or stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-plated steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel or stainless steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.4 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of fiberglass polyurethane or stainless steel.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10, steel pipe hanger except hanger is made of fiberglass-reinforced resin.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless steel.

2.5 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.
c. Flex-Strut Inc.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut Corporation; Tyco International, Ltd.
g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of electro-galvanized steel, stainless steel.
7. Metallic Coating: Electroplated zinc, Hot-dipped galvanized, Mill galvanized, In-line, hot galvanized, Mechanically-deposited zinc.
8. Paint Coating: Vinyl, Vinyl alkyd, Epoxy, Polyester, Acrylic, Amine, Alkyd..
9. Plastic Coating: PVC,Polyurethane, Epoxy, Polyester.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Anvil International; a subsidiary of Mueller Water Products Inc.
b. Empire Industries, Inc.
c. ERICO International Corporation.
d. Haydon Corporation; H-Strut Division.
e. NIBCO INC.
f. PHD Manufacturing, Inc.
g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel or stainless steel.
7. Coating: Zinc, paint, or PVC.

2.6 FIBERGLASS STRUT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Tube & Conduit.
2. Champion Fiberglass, Inc.
3. Cooper B-Line, Inc.
4. SEASAFE, INC.; a Gibraltar Industries Company.

B. Description: Shop- or field-fabricated pipe-support assembly similar to MFMA-4 for supporting multiple parallel pipes.

1. Channels: Continuous slotted fiberglass or other plastic channel with inturned lips.
2. Channel Nuts: Fiberglass nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of fiberglass or stainless steel.

2.7 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Buckaroos, Inc.
2. Carpenter & Paterson, Inc.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. Pipe Shields Inc.
6. Rilco Manufacturing Co., Inc.
7. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psi or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psi minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate with 100-psi, ASTM C 552, Type II cellular glass with 100-psi or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psi minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.8 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Hilti, Inc.
    b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    c. MKT Fastening, LLC.
    d. Simpson Strong-Tie Co., Inc.

B. Mechanical-Expansion Anchors: Insert-wedge-type, [**zinc-coated**] [**stainless-**]steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. B-line, an Eaton business.
    b. Empire Tool and Manufacturing Co., Inc.
    c. Hilti, Inc.
    d. ITW Ramset/Red Head; Illinois Tool Works, Inc.
    e. MKT Fastening, LLC.

2.9 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece [**plastic**] [**stainless-steel**] base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: plastic or stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.

3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.10 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.11 MATERIALS

A. Aluminum: ASTM B 221.

B. Carbon Steel: ASTM A 1011/A 1011M.

C. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A 240/A 240M.

E. Grout: ASTM C 1107/C 1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus [**200 lb**] <**Insert value**>.

3.2 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58. Install hangers and attachments as required to properly support piping from building structure.

D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled strut systems.

E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

F. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2.

3.6 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in **Section 09 91 13 "Exterior Painting", Section 09 91 23 "Interior Painting" and Section 09 96 00 "High-Performance Coatings"** for cleaning andtouchup painting of field welds, bolted connections, and abraded areas of shop paint onmiscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780/A 780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers, fiberglass pipe hangers, fiberglass strut systems and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.

5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
16. Retaining straps shall be used on all C-Clamp style beam clamps.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Elastomeric isolation pads.
2. Elastomeric isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Open-spring isolators.
5. Housed-spring isolators.
6. Restrained-spring isolators.
7. Housed-restrained-spring isolators.
8. Pipe-riser resilient supports.
9. Resilient pipe guides.
10. Elastomeric hangers.
11. Spring hangers.
12. Snubbers.
13. Restraint channel bracings.
14. Restraint cables.
15. Seismic-restraint accessories.
16. Mechanical anchor bolts.
17. Vibration Isolation Roof Curbs

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For each vibration isolation and seismic-restraint device.

1. Include design calculations and details for selecting vibration isolators and seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: **D**.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: **II**.

    a. Component Importance Factor: **Refer to Chapter 13 of ASCE 7-10.**
    b. Component Response Modification Factor: **Refer to chapter 13 of ASCE 7-10.**
    c. Component Amplification Factor: **Refer to Chapter 13 of ASCE 7-10.**

3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.769.
4. Design Spectral Response Acceleration at 1.0-Second Period: 0.383.

2.2 ELASTOMERIC ISOLATION PADS

A. Elastomeric Isolation Pads:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Isolation Technology, Inc.
    b. Kinetics Noise Control, Inc.
    c. Mason Industries, Inc.
    d. Vibration Eliminator Co., Inc.
    e. Vibration Isolation.
    f. Vibration Mountings & Controls, Inc.

2. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.

3. Size: Factory or field cut to match requirements of supported equipment.
4. Pad Material: Oil and water resistant with elastomeric properties.
5. Surface Pattern: Waffle pattern.
6. Infused nonwoven cotton or synthetic fibers.
7. Load-bearing metal plates adhered to pads.

2.3 ELASTOMERIC ISOLATION MOUNTS

A. Double-Deflection, Elastomeric Isolation Mounts:.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Isolation Technology, Inc.
   b. Kinetics Noise Control, Inc.
   c. Mason Industries, Inc.
   d. Vibration Eliminator Co., Inc.
   e. Vibration Isolation.
   f. Vibration Mountings & Controls, Inc.

2. Mounting Plates:

   a. Top Plate: Encapsulated steel load transfer top plates, factory drilled and threaded.
   b. Baseplate: Encapsulated steel bottom plates with holes provided for anchoring to support structure.

3. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.4 RESTRAINED ELASTOMERIC ISOLATION MOUNTS

A. Restrained Elastomeric Isolation Mounts:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Isolation Technology, Inc.
   b. Kinetics Noise Control, Inc.
   c. Mason Industries, Inc.
   d. Vibration Eliminator Co., Inc.
   e. Vibration Isolation.
   f. Vibration Mountings & Controls, Inc.

2. Description: All-directional isolator with seismic restraints containing two separate and opposing elastomeric elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.

   a. Housing: Cast-ductile iron or welded steel.
   b. Elastomeric Material: Molded, oil-resistant rubber, neoprene, or other elastomeric material.

2.5 OPEN-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Isolation Technology, Inc.
   b. Kinetics Noise Control, Inc.
   c. Mason Industries, Inc.
   d. Vibration Eliminator Co., Inc.
   e. Vibration Isolation.
   f. Vibration Mountings & Controls, Inc.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Baseplates: Factory-drilled steel plate for bolting to structure with an elastomeric isolator pad attached to the underside. Baseplates shall limit floor load to 500 psig.
7. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

2.6 HOUSED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Isolation Technology, Inc.
   b. Kinetics Noise Control, Inc.

c. Mason Industries, Inc.
d. Vibration Eliminator Co., Inc.
e. Vibration Isolation.
f. Vibration Mountings & Controls, Inc.

2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

   a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
   b. Top housing with attachment and leveling bolt.

2.7 RESTRAINED-SPRING ISOLATORS

A. Freestanding, Laterally Stable, Open-Spring Isolators with Vertical-Limit Stop Restraint:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.
   c. Vibration Eliminator Co., Inc.
2. Housing: Steel housing with vertical-limit stops to prevent spring extension due to weight being removed.

   a. Base with holes for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
   b. Top plate with threaded mounting holes.
   c. Internal leveling bolt that acts as blocking during installation.

3. Restraint: Limit stop as required for equipment and authorities having jurisdiction.
4. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
5. Minimum Additional Travel: 50 percent of the required deflection at rated load.
6. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
7. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.8 HOUSED-RESTRAINED-SPRING ISOLATORS

A. Freestanding, Steel, Open-Spring Isolators with Vertical-Limit Stop Restraint in Two-Part Telescoping Housing:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Isolation Technology, Inc.
    b. Kinetics Noise Control, Inc.
    c. Mason Industries, Inc.
    d. Vibration Eliminator Co., Inc.
    e. Vibration Isolation.
    f. Vibration Mountings & Controls, Inc.

2. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators. Housings are equipped with adjustable snubbers to limit vertical movement.

    a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psig.
    b. Threaded top housing with adjustment bolt and cap screw to fasten and level equipment.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.9 PIPE-RISER RESILIENT SUPPORT

A. Description: All-directional, acoustical pipe anchor consisting of two steel tubes separated by a minimum 1/2-inch- thick neoprene.

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psig on isolation material providing equal isolation in all directions.

2.10 RESILIENT PIPE GUIDES

A. Description: Telescopic arrangement of two steel tubes or post and sleeve arrangement separated by a minimum 1/2-inch- thick neoprene.

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.11 ELASTOMERIC HANGERS

A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Isolation Technology, Inc.
   b. Kinetics Noise Control, Inc.
   c. Mason Industries, Inc.
   d. Vibration Eliminator Co., Inc.
   e. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.

3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

2.12 SPRING HANGERS

A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Kinetics Noise Control, Inc.
   b. Mason Industries, Inc.
   c. Vibration Eliminator Co., Inc.
   d. Vibration Isolation.
   e. Vibration Mountings & Controls, Inc.

2. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.

3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.

4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
9. Self-centering hanger-rod cap to ensure concentricity between hanger rod and support spring coil.

2.13 SNUBBERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Kinetics Noise Control, Inc.
2. Mason Industries, Inc.
3. Vibration Mountings & Controls, Inc.

B. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch- thick resilient cushion.

2.14 RESTRAINT CHANNEL BRACINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. B-line, an Eaton business.
2. Hilti, Inc.
3. Mason Industries, Inc.
4. Unistrut; Part of Atkore International.

B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.15 RESTRAINT CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Gripple Inc.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. Vibration & Seismic Technologies, LLC.
5. Vibration Mountings & Controls, Inc.

B. Restraint Cables: ASTM A 603 galvanized or ASTM A 492 stainless-steel cables. End connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; with a minimum of two clamping bolts for cable engagement.

2.16 SEISMIC-RESTRAINT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. B-line, an Eaton business.
2. Kinetics Noise Control, Inc.
3. Mason Industries, Inc.
4. Vibration & Seismic Technologies, LLC.

B. Hanger-Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

C. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

D. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

E. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.17 VIBRATION ISOLATION ROOF CURBS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Kinetics Noise Control, Inc.
2. The VCM Group.
3. Thybar Corporation.

B. Prefabricated Vibration isolation curb to be manufactured of prime galvanized steel construction, 18 or 14 gauge as required, meeting ASTM A653/653M, with welded corners and with seams joined by continuous water and air tight welds. Vibration isolation curb shall be internally reinforced with bulkheads 48" on center and factory installed wood nailer. Top of all Vibration isolation curb shall be level, with pitch built into curb when deck slopes. Vibration isolation curb shall be designed to provide a minimum of 90% isolation efficiency with 1" deflection. 9" continuous rubber cover around perimeter of Vibration isolation curb over spring isolators.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by authority having jurisdiction.

B. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

3.2 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in **Section 03 30 00 "Cast-in-Place Concrete" and/or Section 03 30 53" Miscellaneous Cast-in-Place Concrete."**

B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

C. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

D. Equipment Restraints:

1. Install seismic snubbers on HVAC equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

E. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of **40 feet** o.c., and longitudinal supports a maximum of **80 feet** o.c.
3. Brace a change of direction longer than 12 feet.

F. Install cables so they do not bend across edges of adjacent equipment or building structure.

G. Install seismic-restraint devices using methods approved by approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.

H. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

I. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

J. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

K. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 23 21 13 "Hydronic Piping" for piping flexible connections.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. Verify snubber minimum clearances.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brimar Industries, Inc.
    b. Seton Identification Products.

2. Material and Thickness: anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
3. Letter Color: **White.**
4. Background Color: **Black.**
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch for T-bar application and 4 inch by 1-1/2 inch for general application.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Brimar Industries, Inc.
    b. Seton Identification Products.

2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

3. Letter Color: **White.**
4. Background Color: **Black.**
5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch and 4 inch by 1-1/2 inch for general application.
7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
8. Fasteners: Stainless-steel rivets or self-tapping screws.
9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 DUCT LABELS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Brimar Industries, Inc.
2. Seton Identification Products.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, **1/16 inch** thick, and having predrilled holes for attachment hardware.

C. Letter Color: **White.**

D. Background Color: **Black.**

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets or self-tapping screws.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings; also include duct size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions or as separate unit on each duct label to indicate flow direction.

2.3 STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Fiberboard or metal.
2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment. In lay-in, T-bar ceiling applications also install equipment labels on the T-bar beneath the equipment adjacent to ceiling tile that will provide best service access to the equipment. Labels on equipment shall be installed using fasteners. Labels on T-bar may be installed using adhesives.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Section 09 91 23 "Interior Painting" or Section 09 96 00 "High-Performance Coatings."

B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 25 feet along each run.

C. Pipe Label Color Schedule:

1. Chilled-Water Piping: White letters on a safety-green background.
2. Condenser-Water Piping: White letters on a safety-green background.

3. Heating Water Piping: White letters on a safety-green background.
4. Refrigerant Piping: White letters on a safety-black background.
5. Low-Pressure Steam Piping: Black letters on a safety-white background.
6. High-Pressure Steam Piping: Black letters on a safety-white background.
7. Steam Condensate Piping: Black letters on a safety-white background.

3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For cold-air supply ducts.
2. Yellow: For hot-air supply ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.

B. Locate labels near points where ducts enter into and exit from concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

C. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1 inch high is needed for proper identification because of distance from normal location of required identification.

END OF SECTION

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

a. Constant-volume air systems.
b. Dual-duct systems.
c. Variable-air-volume systems.
d. Multizone systems.
e. Induction-unit systems.

2. Balancing Hydronic Piping Systems:

a. Constant-flow hydronic systems.
b. Variable-flow hydronic systems.
c. Primary-secondary hydronic systems.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

1.3 ACTION SUBMITTALS

1. Air-Balance Report: Documentation indicating that Work complies with ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. TAB Report: Documentation indicating that Work complies with ASHRAE/IES 90.1, Section 6.7.2.3 - "System Balancing."

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

D. Certified TAB reports.

E. Sample report forms.

F. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, OR TABB.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB, OR TABB.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, OR TABB.as a TAB technician.

B. TAB Conference: Meet with Engineer, and Commissioning Authority on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide **seven** days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plan.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide **seven** days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens have been replaced by permanent screens with indicated perforations.

L. Examine control valves for proper installation for their intended function of throttling, diverting, or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures for balancing the systems.

B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Airside:

a. Duct systems are complete with terminals installed.
b. Volume, smoke, and fire dampers are open and functional.
c. Clean filters are installed.
d. Fans are operating, free of vibration, and rotating in correct direction.
e. Variable-frequency controllers' startup is complete and safeties are verified.
f. Automatic temperature-control systems are operational.
g. Ceilings are installed.
h. Windows and doors are installed.
i. Suitable access to balancing devices and equipment is provided.

2. Hydronics:

a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed.
b. Piping is complete with terminals installed.
c. Water treatment is complete.
d. Systems are flushed, filled, and air purged.
e. Strainers are pulled and cleaned.
f. Control valves are functioning per the sequence of operation.
g. Shutoff and balance valves have been verified to be 100 percent open.
h. Pumps are started and proper rotation is verified.
i. Pump gage connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
j. Variable-frequency controllers' startup is complete and safeties are verified.
k. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in **NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems"**and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 23 33 00 "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 07 13 "Duct Insulation ,"Section 23 07 16 "HVAC Equipment Insulation," and Section 23 07 19 "HVAC PipingInsulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in **inch-pound (IP)** units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 23 31 13 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
    b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
    c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
    d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

2. Measure fan static pressures as follows:

    a. Measure static pressure directly at the fan outlet or through the flexible connection.
    b. Measure static pressure directly at the fan inlet or through the flexible connection.
    c. Measure static pressure across each component that makes up the air-handling system.
    d. Report artificial loading of filters at the time static pressures are measured.

3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
4. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.

1. Measure airflow of submain and branch ducts.
2. Adjust submain and branch duct volume dampers for specified airflow.
3. Re-measure each submain and branch duct after all have been adjusted.

C. Adjust air inlets and outlets for each space to indicated airflows.

1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
2. Measure inlets and outlets airflow.
3. Adjust each inlet and outlet for specified airflow.
4. Re-measure each inlet and outlet after they have been adjusted.

3.6 PROCEDURES FOR DUAL-DUCT SYSTEMS

A. Verify that the cooling coil is capable of full-system airflow, and set mixing boxes at full-cold airflow position for fan volume.

B. Measure static pressure in both hot and cold ducts at the end of the longest duct run to determine that sufficient static pressure exists to operate controls of mixing boxes and to overcome resistance in the ducts and outlets downstream from mixing boxes.

1. If insufficient static pressure exists, increase airflow at the fan.

C. Test and adjust the constant-volume mixing boxes as follows:

1. Verify both hot and cold operations by adjusting the thermostat and observing changes in air temperature and volume.

2. Verify sufficient inlet static pressure before making volume adjustments.
3. Adjust mixing boxes to indicated airflows within specified tolerances. Measure airflow by Pitot-tube traverse readings or by measuring static pressure at mixing-box taps if provided by mixing-box manufacturer.

D. Do not overpressurize ducts.

E. Remeasure static pressure in both hot and cold ducts at the end of the longest duct run to determine that sufficient static pressure exists to operate controls of mixing boxes and to overcome resistance in the ducts and outlets downstream from mixing boxes.

F. Adjust variable-air-volume, dual-duct systems in the same way as constant-volume, dual-duct systems; adjust maximum- and minimum-airflow setting of each mixing box.

3.7 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Adjust the variable-air-volume systems as follows:

1. Verify that the system static pressure sensor is located two-thirds of the distance down the duct from the fan discharge.
2. Verify that the system is under static pressure control.
3. Select the terminal unit that is most critical to the supply-fan airflow. Measure inlet static pressure, and adjust system static pressure control set point so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
4. Calibrate and balance each terminal unit for maximum and minimum design airflow as follows:

    a. Adjust controls so that terminal is calling for maximum airflow. Some controllers require starting with minimum airflow. Verify calibration procedure for specific project.
    b. Measure airflow and adjust calibration factor as required for design maximum airflow. Record calibration factor.
    c. When maximum airflow is correct, balance the air outlets downstream from terminal units.
    d. Adjust controls so that terminal is calling for minimum airflow.
    e. Measure airflow and adjust calibration factor as required for design minimum airflow. Record calibration factor. If no minimum calibration is available, note any deviation from design airflow.
    f. When in full cooling or full heating, ensure that there is no mixing of hot-deck and cold-deck airstreams unless so designed.
    g. On constant volume terminals, in critical areas where room pressure is to be maintained, verify that the airflow remains constant over the full range of full cooling to full heating. Note any deviation from design airflow or room pressure.

5. After terminals have been calibrated and balanced, test and adjust system for total airflow. Adjust fans to deliver total design airflows within the maximum allowable fan speed listed by fan manufacturer.

a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
b. Set terminals for maximum airflow. If system design includes diversity, adjust terminals for maximum and minimum airflow so that connected total matches fan selection and simulates actual load in the building.
c. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
d. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
e. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.

6. Measure fan static pressures as follows:

a. Measure static pressure directly at the fan outlet or through the flexible connection.
b. Measure static pressure directly at the fan inlet or through the flexible connection.
c. Measure static pressure across each component that makes up the air-handling system.
d. Report any artificial loading of filters at the time static pressures are measured.

7. Set final return and outside airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

a. Balance the return-air ducts and inlets the same as described for constant-volume air systems.
b. Verify that terminal units are meeting design airflow under system maximum flow.

8. Re-measure the inlet static pressure at the most critical terminal unit and adjust the system static pressure set point to the most energy-efficient set point to maintain the optimum system static pressure. Record set point and give to controls contractor.
9. Verify final system conditions as follows:

a. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to match design if necessary.
b. Re-measure and confirm that total airflow is within design.
c. Re-measure final fan operating data, rpms, volts, amps, and static profile.
d. Mark final settings.
e. Test system in economizer mode. Verify proper operation and adjust if necessary. Measure and record all operating data.
f. Verify tracking between supply and return fans.

3.8 PROCEDURES FOR MULTIZONE SYSTEMS

A. Set unit at maximum airflow through the cooling coil.

B. Adjust each zone's balancing damper to achieve indicated airflow within the zone.

3.9 PROCEDURES FOR INDUCTION-UNIT SYSTEMS

A. Balance primary-air risers by measuring static pressure at the nozzles of the top and bottom units of each riser to determine which risers must be throttled. Adjust risers to indicated airflow within specified tolerances.

B. Adjust each induction unit.

3.10 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports for pumps, coils, and heat exchangers. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and heat exchanger flow rates with pump design flow rate.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:

1. Check liquid level in expansion tank.
2. Check highest vent for adequate pressure.
3. Check flow-control valves for proper position.
4. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
5. Verify that motor starters are equipped with properly sized thermal protection.
6. Check that air has been purged from the system.

3.11 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:

1. Verify that the differential-pressure sensor is located as indicated.
2. Determine whether there is diversity in the system.

C. For systems with no diversity:

1. Adjust pumps to deliver total design gpm.

    a. Measure total water flow.

        1) Position valves for full flow through coils.
        2) Measure flow by main flow meter, if installed.
        3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

    b. Measure pump TDH as follows:

1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
3) Convert pressure to head and correct for differences in gage heights.
4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

2. Adjust flow-measuring devices installed in mains and branches to design water flows.

a. Measure flow in main and branch pipes.
b. Adjust main and branch balance valves for design flow.
c. Re-measure each main and branch after all have been adjusted.

3. Adjust flow-measuring devices installed at terminals for each space to design water flows.

a. Measure flow at terminals.
b. Adjust each terminal to design flow.
c. Re-measure each terminal after it is adjusted.
d. Position control valves to bypass the coil and adjust the bypass valve to maintain design flow.
e. Perform temperature tests after flows have been balanced.

4. For systems with pressure-independent valves at terminals:

a. Measure differential pressure and verify that it is within manufacturer's specified range.
b. Perform temperature tests after flows have been verified.

5. For systems without pressure-independent valves or flow-measuring devices at terminals:

a. Measure and balance coils by either coil pressure drop or temperature method.
b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

6. Prior to verifying final system conditions, determine the system differential-pressure set point.
7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
8. Mark final settings and verify that all memory stops have been set.
9. Verify final system conditions as follows:

a. Re-measure and confirm that total water flow is within design.
b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
c. Mark final settings.

10. Verify that memory stops have been set.

D. For systems with diversity:

1. Determine diversity factor.
2. Simulate system diversity by closing required number of control valves, as approved by the design engineer.
3. Adjust pumps to deliver total design gpm.

a. Measure total water flow.

1) Position valves for full flow through coils.
2) Measure flow by main flow meter, if installed.
3) If main flow meter is not installed, determine flow by pump TDH or exchanger pressure drop.

b. Measure pump TDH as follows:

1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
3) Convert pressure to head and correct for differences in gage heights.
4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
5) With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved.

c. Monitor motor performance during procedures and do not operate motor in an overloaded condition.

4. Adjust flow-measuring devices installed in mains and branches to design water flows.

a. Measure flow in main and branch pipes.
b. Adjust main and branch balance valves for design flow.
c. Re-measure each main and branch after all have been adjusted.

5. Adjust flow-measuring devices installed at terminals for each space to design water flows.

a. Measure flow at terminals.
b. Adjust each terminal to design flow.
c. Re-measure each terminal after it is adjusted.
d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
e. Perform temperature tests after flows have been balanced.

6. For systems with pressure-independent valves at terminals:

    a. Measure differential pressure, and verify that it is within manufacturer's specified range.
    b. Perform temperature tests after flows have been verified.

7. For systems without pressure-independent valves or flow-measuring devices at terminals:

    a. Measure and balance coils by either coil pressure drop or temperature method.
    b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.
9. Prior to verifying final system conditions, determine system differential-pressure set point.
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion open discharge valve 100 percent and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:

    a. Re-measure and confirm that total water flow is within design.
    b. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
    c. Mark final settings.

13. Verify that memory stops have been set.

3.12 PROCEDURES FOR HEAT EXCHANGERS

A. Measure water flow through all circuits.

B. Adjust water flow to within specified tolerances.

C. Measure inlet and outlet water temperatures.

D. Measure inlet steam pressure.

E. Check settings and operation of safety and relief valves. Record settings.

3.13 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.

5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.14 NITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.15 PROCEDURES FOR BOILERS

A. Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.

B. Steam Boilers: Measure and record entering-water temperature and flow and leaving-steam pressure, temperature, and flow.

3.16 TOLERANCES

A. Set HVAC system's airflow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.

B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.17 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

3.18 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.

h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Center-to-center dimensions of sheave and amount of adjustments in inches.
j. Number, make, and size of belts.
k. Number, type, and size of filters.

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Center-to-center dimensions of sheave and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat-coil static-pressure differential in inches wg.
g. Cooling-coil static-pressure differential in inches wg.
h. Heating-coil static-pressure differential in inches wg.
i. Outdoor airflow in cfm.
j. Return airflow in cfm.
k. Outdoor-air damper position.

l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in sq. ft..
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outdoor-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

G. Gas- and Oil-Fired Heat Apparatus Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Fuel type in input data.
g. Output capacity in Btu/h.
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.

k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches, and bore.
n. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Entering-air temperature in deg F.
c. Leaving-air temperature in deg F.
d. Air temperature differential in deg F.
e. Entering-air static pressure in inches wg.
f. Leaving-air static pressure in inches wg.
g. Air static-pressure differential in inches wg.
h. Low-fire fuel input in Btu/h.
i. High-fire fuel input in Btu/h.
j. Manifold pressure in psig.
k. High-temperature-limit setting in deg F.
l. Operating set point in Btu/h.
m. Motor voltage at each connection.
n. Motor amperage for each phase.
o. Heating value of fuel in Btu/h.

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:

1. Unit Data:

a. System identification.
b. Location.
c. Coil identification.
d. Capacity in Btu/h.
e. Number of stages.
f. Connected volts, phase, and hertz.
g. Rated amperage.
h. Airflow rate in cfm.
i. Face area in sq. ft..
j. Minimum face velocity in fpm.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h.
b. Airflow rate in cfm.
c. Air velocity in fpm.
d. Entering-air temperature in deg F.
e. Leaving-air temperature in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

    a. System identification.
    b. Location.
    c. Make and type.
    d. Model number and size.
    e. Manufacturer's serial number.
    f. Arrangement and class.
    g. Sheave make, size in inches, and bore.
    h. Center-to-center dimensions of sheave and amount of adjustments in inches.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
    g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

    a. Total airflow rate in cfm.
    b. Total system static pressure in inches wg.
    c. Fan rpm.
    d. Discharge static pressure in inches wg.
    e. Suction static pressure in inches wg.

J. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

    a. System and air-handling-unit number.
    b. Location and zone.
    c. Traverse air temperature in deg F.
    d. Duct static pressure in inches wg.
    e. Duct size in inches.
    f. Duct area in sq. ft..
    g. Indicated airflow rate in cfm.
    h. Indicated velocity in fpm.
    i. Actual airflow rate in cfm.
    j. Actual average velocity in fpm.
    k. Barometric pressure in psig.

K. Air-Terminal-Device Reports:

1. Unit Data:

    a. System and air-handling unit identification.

b. Location and zone.
c. Apparatus used for test.
d. Area served.
e. Make.
f. Number from system diagram.
g. Type and model number.
h. Size.
i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling-unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. Water pressure drop in feet of head or psig.
e. Entering-air temperature in deg F.
f. Leaving-air temperature in deg F.

M. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.

i. Pump rpm.
j. Impeller diameter in inches.
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig.
b. Pump shutoff pressure in feet of head or psig.
c. Actual impeller size in inches.
d. Full-open flow rate in gpm.
e. Full-open pressure in feet of head or psig.
f. Final discharge pressure in feet of head or psig.
g. Final suction pressure in feet of head or psig.
h. Final total pressure in feet of head or psig.
i. Final water flow rate in gpm.
j. Voltage at each connection.
k. Amperage for each phase.

N. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.19 VERIFICATION OF TAB REPORT

A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of engineer and/or commissioning authority.

B. Engineer and/or commissioning authority shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

E. If TAB work fails, proceed as follows:

1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
3. If the second verification also fails, design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.

F. Prepare test and inspection reports.

3.20 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
11. Outdoor, concealed supply and return.
12. Outdoor, exposed supply and return.

B. Related Sections:

1. Section 23 07 16 "HVAC Equipment Insulation."
2. Section 230 7 19 "HVAC Piping Insulation."
3. Section 23 31 13 "Metal Ducts" for duct liners.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For coatings, indicating VOC content.
4. Laboratory Test Reports: For coatings, indicating compliance with requirements for low-emitting materials.
5. Product Data: For sealants, indicating VOC content.
6. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA, Inc.; Aerocel.
    b. Armacell LLC; AP Armaflex.
    c. K-Flex USA; Insul-Sheet, K-Flex Gray Duct Liner, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, **Type III with factory-applied FSK jacket**. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Knauf Insulation.
    d. Owens Corning.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide

insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. CertainTeed Corporation.
    b. Johns Manville; a Berkshire Hathaway company.
    c. Knauf Insulation.
    d. Owens Corning.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Aeroflex USA, Inc.; Aeroseal.
    b. Armacell LLC; Armaflex 520 Adhesive.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
    d. K-Flex USA; R-373 Contact Adhesive.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Mon-Eco Industries, Inc.

2. Fiberglass adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of

Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Mon-Eco Industries, Inc.

2. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Dow Corning Corporation.
   b. Johns Manville; a Berkshire Hathaway company.
   c. P.I.C. Plastics, Inc.
   d. Speedline Corporation.

2. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. VOC Content: **300** g/L or less.
2. Low-Emitting Materials: Mastic coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the

Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Knauf Insulation.
   c. Vimasco Corporation.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
   b. Eagle Bridges - Marathon Industries; 570.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.

2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.

D. Color: White.Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. Childers Brand; H. B. Fuller Construction Products.
   b. Eagle Bridges - Marathon Industries.
   c. Knauf Insulation.
   d. Mon-Eco Industries, Inc.
   e. Vimasco Corporation.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.
    b. Eagle Bridges - Marathon Industries.
    c. Foster Brand; H. B. Fuller Construction Products.
    d. Mon-Eco Industries, Inc.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Childers Brand; H. B. Fuller Construction Products.

2. Materials shall be compatible with insulation materials, jackets, and substrates.

3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.6 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for ducts.

1. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Johns Manville; a Berkshire Hathaway company.
b. P.I.C. Plastics, Inc.
c. Proto Corporation.
d. Speedline Corporation.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: **White.**

D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. ITW Insulation Systems; Illinois Tool Works, Inc.
    b. RPR Products, Inc.

2. Sheet and roll stock ready for shop or field sizing.

3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polysurlyn.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polysurlyn.

E. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with **stucco-embossed** aluminum-foil facing.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Polyguard Products, Inc.

2.8 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Avery Dennison Corporation, Specialty Tapes Division.
    b. Compac Corporation.
    c. Ideal Tape Co., Inc., an American Biltrite Company.
    d. Knauf Insulation.
    e. Venture Tape.

2. Width: 3 inches.

3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Avery Dennison Corporation, Specialty Tapes Division.
    b. Compac Corporation.
    c. Ideal Tape Co., Inc., an American Biltrite Company.
    d. Knauf Insulation.
    e. Venture Tape.

2. Width: 3 inches.

3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Compac Corporation.
    b. Ideal Tape Co., Inc., an American Biltrite Company.
    c. Venture Tape.

2. Width: 2 inches.

3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Avery Dennison Corporation, Specialty Tapes Division.
    b. Compac Corporation.
    c. Ideal Tape Co., Inc., an American Biltrite Company.
    d. Knauf Insulation.

e. Venture Tape.

2. Width: 2 inches.

3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. ITW Insulation Systems; Illinois Tool Works, Inc.
   b. RPR Products, Inc.

2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, **Type 304**; 0.015 inch thick, 3/4 inch wide with wing seal or closed seal.
3. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, **3/4 inch** wide with wing seal.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated.
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) Gemco.
      2) Hardcast, Inc.
      3) Midwest Fasteners, Inc.
      4) Nelson Stud Welding.

2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Gemco.
2) Hardcast, Inc.
3) Midwest Fasteners, Inc.
4) Nelson Stud Welding.

3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Gemco.
2) Hardcast, Inc.
3) Midwest Fasteners, Inc.
4) Nelson Stud Welding.

b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

c. Spindle: Z**inc-coated, low-carbon steel** fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1) Gemco.
2) Midwest Fasteners, Inc.

b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.

c. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.

d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) Gemco.
      2) Hardcast, Inc.
      3) Midwest Fasteners, Inc.

   b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

   c. Spindle: Z**inc-coated, low-carbon steel** fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
   d. Adhesive-backed base with a peel-off protective cover.

6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, **galvanized-steel**, **aluminum, or stainless-steel** sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) Gemco.
      2) Hardcast, Inc.
      3) Midwest Fasteners, Inc.
      4) Nelson Stud Welding.

   b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

7. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

      1) Gemco.
      2) Midwest Fasteners, Inc.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.062-inch soft-annealed, stainless steel.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. C & F Wire.

2.10 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: **0.040 inch** thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 6 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with insulation pins.
1. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

2. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 6 inches o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

3. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
4. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
5. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 90 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 6 inches o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

   1. Draw jacket material smooth and tight.
   2. Install lap or joint strips with same material as jacket.
   3. Secure jacket to insulation with manufacturer's recommended adhesive.
   4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
   5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

   1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof

sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.8 FINISHES

A. Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 " InteriorPainting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

C. Do not field paint aluminum or stainless-steel jackets.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to **one** location for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.

2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, exposed return located in unconditioned space.
5. Indoor, concealed, Type I, commercial, kitchen hood exhaust.
6. Indoor, exposed, Type I, commercial, kitchen hood exhaust.
7. Indoor, concealed oven and warewash exhaust.
8. Indoor, exposed oven and warewash exhaust.
9. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
10. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
11. Outdoor, concealed supply and return.
12. Outdoor, exposed supply and return.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.11 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Mineral-fiber blanket, 0.750lb/cu. ft. nominal density (R-8 installed, minimum).

3.12 ABOVEGROUND, OUTDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a duct system, selection from materials listed is Contractor's option.

1. Supply-Air and Return-Air Duct and Plenum Insulation: Flexible Elastomeric Closed Cell: **2 inch** thick (R-8 minimum).

3.13 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Ducts and Plenums:
1. Aluminum, **Stucco Embossed**: **0.020 inch** thick.

D. Ducts and Plenums, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Aluminum, **Stucco Embossed**: **0.020 inch** thick.

END OF SECTION

SECTION 23 08 00 - COMMISSIONING OF HVAC

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

B. Related Sections:

1. Division 01 Section "General Commissioning Requirements" for general commissioning process requirements.

1.03 DEFINITIONS

A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

B. CxA: Commissioning Authority.

C. HVAC&R: Heating, Ventilating, Air Conditioning, and Refrigeration.

D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.04 INFORMATIONAL SUBMITTALS

A. Certificates of readiness.

B. Certificates of completion of installation, prestart, and startup activities.

1.05 ALLOWANCES

A. Labor, instrumentation, tools, and equipment costs for technicians for the performance of commissioning testing are covered by the "Schedule of Allowances" Article in Division 01 Section "Allowances."

1.06 UNIT PRICES

A. Commissioning testing allowance may be adjusted up or down by the "List of Unit Prices" Article in Division 01 Section "Unit Prices" when actual man-hours are computed at the end of commissioning testing.

1.07 CONTRACTOR'S RESPONSIBILITIES

A. Perform commissioning tests at the direction of the CxA.

B. Attend construction phase controls coordination meeting.

C. Attend testing, adjusting, and balancing review and coordination meeting.

D. Participate in HVAC&R systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

E. Provide information requested by the CxA for final commissioning documentation.

F. Provide measuring instruments and logging devices to record test data and provide data acquisition equipment to record data for the complete range of testing for the required test period.

1.08 CxA'S RESPONSIBILITIES

A. Provide Project-specific construction checklists and commissioning process test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract.

B. Direct commissioning testing.

C. Verify testing, adjusting, and balancing of Work are complete.

D. Provide test data, inspection reports, and certificates in Systems Manual.

1.09 COMMISSIONING DOCUMENTATION

A. Provide the following information to the CxA for inclusion in the commissioning plan:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
3. Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.
4. Certificate of completion certifying that installation, prestart checks, and startup procedures have been completed.
5. Certificate of readiness certifying that HVAC&R systems, subsystems, equipment, and associated controls are ready for testing.
6. Test and inspection reports and certificates.
7. Corrective action documents.
8. Verification of testing, adjusting, and balancing reports.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 TESTING PREPARATION

A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.02 Testing AND BALANCING VERIFICATION

A. Prior to performance of testing and balancing Work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least **10** days in advance of testing and balancing Work, and provide access for the CxA to witness testing and balancing Work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify testing and balancing Contractor 10 days in advance of the date of field verification. Notice will not include data points to be verified.
2. The testing and balancing Contractor shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes, other than sound, a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final testing, adjusting, and balancing report. For sound pressure readings, a deviation of 3 dB shall result in rejection of final testing. Variations in background noise must be considered.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.03 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the HVAC&R Contractor, testing and balancing Contractor, and HVAC&R Instrumentation and Control Contractor shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Owner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.04 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Boiler Testing and Acceptance Procedures: Testing requirements are specified in Division 23 boiler Sections. Provide submittals, test data, inspector record, and boiler certification to the CxA.

B. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls." Assist the CxA with preparation of testing plans.

C. Pipe system cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 23 piping Sections. HVAC&R Contractor shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of

piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.
4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Refrigeration System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

E. HVAC&R Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust; and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

F. Vibration and Sound Tests: Provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

END OF SECTION

SECTION 23 23 00 – REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and refrigerant piping specialty.

B. Shop Drawings:

1. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
2. Show interface and spatial relationships between piping and equipment.
3. Shop Drawing Scale: 1/4 inch equals 1 foot.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-134a:

1. Suction Lines for Air-Conditioning Applications: 115 psig.
2. Suction Lines for Heat-Pump Applications: 225 psig.
3. Hot-Gas and Liquid Lines: 225 psig.

B. Line Test Pressure for Refrigerant R-407C:

1. Suction Lines for Air-Conditioning Applications: 230 psig.
2. Suction Lines for Heat-Pump Applications: 380 psig.
3. Hot-Gas and Liquid Lines: 380 psig.

C. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
4. Working Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Heldon Products; Henry Technologies.
    b. Mueller Industries, Inc.
    c. Sherwood Valve, LLC.

2. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.

3. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
4. Operator: Rising stem and hand wheel.
5. Seat: Nylon.
6. End Connections: Socket, union, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Heldon Products; Henry Technologies.
    b. Mueller Industries, Inc.
    c. Sherwood Valve, LLC.

2. Body and Bonnet: Forged brass or cast bronze.

3. Packing: Molded stem, back seating, and replaceable under pressure.
4. Operator: Rising stem.
5. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
6. Seal Cap: Forged-brass or valox hex cap.
7. End Connections: Socket, union, threaded, or flanged.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Mueller Industries, Inc.
    b. Sherwood Valve, LLC.

2. Body: Ductile iron, forged brass, or cast bronze; globe pattern.

3. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
4. Piston: Removable polytetrafluoroethylene seat.
5. Closing Spring: Stainless steel.
6. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged.
8. Maximum Opening Pressure: 0.50 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Parker Hannifin Corp.
    e. Refrigeration Sales, Inc.

2. Body: Forged brass with brass cap including key end to remove core.

3. Core: Removable ball-type check valve with stainless-steel spring.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Copper spring.
6. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with AHRI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Parker Hannifin Corp.

2. Body and Bonnet: Plated steel.

3. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.
6. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and [24] [115] [208]-V ac coil.
7. Working Pressure Rating: 400 psig.
8. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with 2010 ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Heldon Products; Henry Technologies.
    c. Parker Hannifin Corp.
    d. Paul Mueller Company.

2. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.

3. Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Threaded.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with AHRI 750.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Danfoss Inc.
    b. Emerson Climate Technologies.
    c. Heldon Products; Henry Technologies.
    d. Parker Hannifin Corporation; Sporlan Division.

2. Body, Bonnet, and Seal Cap: Forged brass or steel.

3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Capillary and Bulb: Copper tubing filled with refrigerant charge.
6. Suction Temperature: 40 deg F.
7. Superheat: Adjustable
8. Reverse-flow option (for heat-pump applications).
9. End Connections: Socket, flare, or threaded union.
10. Working Pressure Rating: 700 psig.

H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.

2. Body, Bonnet, and Seal Cap: Ductile iron or steel.

3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
6. Seat: Polytetrafluoroethylene.
7. Equalizer: [Internal] [External].
8. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter and 208-V ac coil.
9. End Connections: Socket.
10. Set Pressure: <Insert psig>.
11. Throttling Range: Maximum 5 psig.
12. Working Pressure Rating: 500 psig.
13. Maximum Operating Temperature: 240 deg F.

I. Straight-Type Strainers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.

2. Body: Welded steel with corrosion-resistant coating.

3. Screen: 100-mesh stainless steel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

J. Angle-Type Strainers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Heldon Products; Henry Technologies.
c. Parker Hannifin Corp.

2. Body: Forged brass or cast bronze.

3. Drain Plug: Brass hex plug.
4. Screen: 100-mesh monel.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

K. Moisture/Liquid Indicators:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Danfoss Inc.
b. Emerson Climate Technologies.
c. Heldon Products; Henry Technologies.
d. Parker Hannifin Corp.

2. Body: Forged brass.

3. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
4. Indicator: Color coded to show moisture content in parts per million (ppm).
5. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
6. End Connections: Socket or flare.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Arkema Inc.
b. DuPont Fluorochemicals Div.
c. Genetron Refrigerants; Honeywell International Inc.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-134a

A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints (see manufacturer's instructions)

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints (see manufacturer's instructions).

C. Safety-Relief-Valve Discharge Piping: Copper, Type L, drawn-temper tubing and wrought-copper fittings with soldered joints (see manufacturer's instructions).

3.2 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

D. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

E. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type L, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

F. Safety-Relief-Valve Discharge Piping: Copper, Type L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

G. Safety-Relief-Valve Discharge Piping: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

H. Safety-Relief-Valve Discharge Piping: Copper, Type L, drawn-temper tubing and wrought-copper fittings with 95-5 tin-antimony soldered joints.

I. Safety-Relief-Valve Discharge Piping: Copper, Type L, drawn-temper tubing and wrought-copper fittings with Alloy HB soldered joints.

3.3 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless or packed-angle valves on inlet and outlet side of filter dryers.

E. Install a full-size, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.4 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Identify refrigerant piping and valves according to Section 23 05 53 "Identification for HVAC Piping and Equipment."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 23 05 17 "Sleeves and Sleeve Seals for HVAC Piping."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 23 05 17 "Sleeves and Sleeve Seals for HVAC Piping."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 23 05 18 "Escutcheons for HVAC Piping."

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.6 HANGERS AND SUPPORTS

A. Comply with requirements for pipe hangers and supports specified in Section 23 05 29 " Hangersand Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:

1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.

3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

B. Prepare test and inspection reports.

3.8 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.9 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

3.10 INSULATION

A. Schedule – Provide insulation on all refrigerant piping
    1. Interior piping: flexible elastomeric 1” insulation

2. Interior exposed piping: flexible elastomeric 1” insulation with PVC jacketing in kitchen so it can be wiped down.
3. Exterior exposed piping: Alumaguard exterior weatherproofing jacketing and insulation system
4. Per manufacturer’s instructions

END OF SECTION 23 23 00

SECTION 23 31 13 – METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Double-wall rectangular ducts and fittings.
3. Single-wall round ducts and fittings.
4. Double-wall round ducts and fittings.
5. Sheet metal materials.
6. Duct liner.
7. Sealants and gaskets.
8. Hangers and supports.
9. Seismic-restraint devices.

B. Related Sections:

1. Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, andbalancing requirements for metal ducts.
2. Section 23 31 16 "Nonmetal Ducts" for fibrous-glass ducts and PVC ducts.
3. Section 23 33 00 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7. SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Seismic Hazard Level A: Seismic force to weight ratio, 0.48.
2. Seismic Hazard Level B: Seismic force to weight ratio, 0.30.
3. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ANSI/ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports and seismic restraints.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.

e. Access panels.
f. Perimeter moldings.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. McGill AirFlow LLC.
2. Sheet Metal Connectors, Inc.

B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.

C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

F. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

G. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.

1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

H. Inner Duct: Minimum 0.028-inch solid sheet steel.

I. Formed-on Transverse Joints (Flanges): Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Traverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

J. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal

Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

    a. Ductmate Industries, Inc.
    b. Elgen Manufacturing.
    c. McGill AirFlow LLC.
    d. Sheet Metal Connectors, Inc.
    e. Spiral Manufacturing Co., Inc.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 30 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 DOUBLE-WALL ROUND DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. McGill AirFlow LLC.
2. SEMCO Incorporated.
3. Sheet Metal Connectors, Inc.

B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.

1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Transverse Joints in Ducts Larger Than 30 Inches in Diameter: Flanged.

2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Inner Duct: Minimum 0.028-inch solid sheet steel.

D. Interstitial Insulation: Fibrous-glass liner complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Maximum Thermal Conductivity: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Install spacers that position the inner duct at uniform distance from outer duct without compressing insulation.
3. Coat insulation with antimicrobial coating.
4. Cover insulation with polyester film complying with UL 181, Class 1.

E. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.

1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2.5 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.6 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.

    e. Maximum Thermal Conductivity:
        1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg Fat 75 deg F mean temperature.
        2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg Fat 75 deg F mean temperature.
3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
    a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile

Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
   1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:
      a. Aeroflex USA Inc.
      b. Armacell LLC.
      c. Rubatex International, LLC
      d. <Insert manufacturer's name>.
   3. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
   4. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
      a. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Natural-Fiber Duct Liner: 85 percent cotton, 10 percent borate, and 5 percent polybinding fibers, treated with a microbial growth inhibitor and complying with NFPA 90A or NFPA 90B.
   1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
      a. Bonded Logic, Inc.
      b. Reflectix Inc.
   3. Maximum Thermal Conductivity: 0.24 Btu x in./h x sq. ft. x deg Fat 75 deg F mean temperature when tested according to ASTM C 518.
   4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to ASTM E 84; certified by an NRTL.
   5. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
      a. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
      b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick stainless steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

E. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.7 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.

2. Tape Width: 4 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.8 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.9 SEISMIC-RESTRAINT DEVICES

A. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

B. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.

C. Restraint Cables: ASTM A 492, stainless-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.

D. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections or Reinforcing steel angle clamped to hanger rod.

E. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 33 00 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet Insert dimension in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts at a minimum to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."

1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
2. Brace a change of direction longer than 12 feet.

B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints on ducts that are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.7 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 23 33 00 " Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.8 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 23 33 00 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. Ducts Connected to Constant-Volume Air-Handling Units <Insert equipment>:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: [A] [B].
c. SMACNA Leakage Class for Rectangular: [6] [12] [24] <Insert value>.

C. Return Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: [A] [B].
c. SMACNA Leakage Class for Rectangular: [6] [12] [24] <Insert value>.
d. SMACNA Leakage Class for Round and Flat Oval: [6] [12] [24] <Insert value>.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 2-inch wg.
b. Minimum SMACNA Seal Class: [A] [B] [C] if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: [12] [24] <Insert value>.
d. SMACNA Leakage Class for Round and Flat Oval: [6] [12] [24] <Insert value>.

2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

a. Exposed to View: Type 304, stainless-steel sheet, [No. 4] [No. 3] <Insert finish> finish.
b. Concealed: [Type 304, stainless-steel sheet, No. 2D finish] [Carbon-steel sheet].
c. Welded seams and joints.
d. Pressure Class: Positive or negative [2-inch wg] [3-inch wg] [4-inch wg] <Insert value>.
e. Airtight/Watertight.

3. Ducts Connected to Dishwasher Hoods:

a. Type 304, stainless-steel sheet.
b. Exposed to View: [No. 4] [No. 3] <Insert finish> finish.
c. Concealed: [No. 2D] <Insert finish> finish.
d. Welded seams and flanged joints with watertight EPDM gaskets.
e. Pressure Class: Positive or negative 2-inch wg.
f. Airtight/Watertight.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

2. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.

c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. PVC-Coated Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.

3. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.

4. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 23 31 13

SECTION 23 31 16 - NONMETAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fibrous-glass ducts and fittings.
2. Phenolic-foam ducts and fittings.
3. Thermoset FRP ducts and fittings.
4. PVC ducts and fittings.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for nonmetal ducts.
2. Section 233113 "Metal Ducts" for single- and double-wall, rectangular and round ducts.
3. Section 233119 "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
4. Section 233300 "Air Duct Accessories" for dampers, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Sustainable Design Submittals:

1. Product Data: For ventilation equipment, indicating compliance with ASHRAE 62.1, Section 5 - "Systems and Equipment."
2. Product Data: For adhesives, indicating VOC content.
3. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
4. Product Data: For sealants, indicating VOC content.
5. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.

2. Duct layout indicating sizes and pressure classes.
3. Elevation of top of ducts.
4. Dimensions of main duct runs from building grid lines.
5. Fittings.
6. Reinforcement and spacing.
7. Seam and joint construction.
8. Penetrations through fire-rated and other partitions.
9. Equipment installation based on equipment being used on Project.
10. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

1.5 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

C. NFPA Compliance:

1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

PART 2 - PRODUCTS

2.1 FIBROUS-GLASS DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. CertainTeed Corporation.
2. Johns Manville; a Berkshire Hathaway company.
3. Knauf Insulation.
4. Owens Corning.

B. Fibrous-Glass Duct Materials: Resin-bonded fiberglass, faced on the outside surface with fire-resistive FSK vapor retarder and with a smooth fiberglass mat finish on the air-side surface.

1. Duct Board: Factory molded into rectangular boards.
2. Round Duct: Factory molded into straight round duct and smooth fittings.
3. Temperature Limits: 40 to 250 deg F inside ducts; 150 deg F ambient temperature surrounding ducts.
4. Maximum Thermal Conductivity: [**0.24 Btu x in./h x sq. ft. x deg F**] <**Insert conductivity**> at 75 deg F mean temperature.
5. Moisture Absorption: Not exceeding 5 percent by weight at 120 deg F and 95 percent relative humidity for 96 hours when tested according to ASTM C 1104/C 1104M.
6. Permeability: 0.02 perms maximum when tested according to ASTM E 96/E 96M, Procedure A.
7. Antimicrobial Agent: Compound shall be tested for efficacy by an NRTL, and registered by the EPA for use in HVAC systems.
8. Noise-Reduction Coefficient: 0.65 minimum when tested according to ASTM C 423, Mounting A.
9. Required Markings: EI rating, UL label, and other markings required by UL 181 on each full sheet of duct board.

C. Closure Materials:

1. Pressure-Sensitive Tape: Comply with UL 181A; imprinted by the manufacturer with the coding "181A-P," the manufacturer's name, and a date code.

    a. Tape: Aluminum foil-scrim tape imprinted with listing information.
    b. Minimum Tape Width: 2-1/2 inches; 3 inches for duct board thicker than 1 inch.
    c. Staples: 1/2-inch outward clinching, 2 inches o.c. in tabs, one tab per joint.
    d. Water resistant.
    e. Mold and mildew resistant.

2. Heat-Activated Tape: Comply with UL 181A; imprinted by the manufacturer with the coding "181A-H," the manufacturer's name, and a date code.

    a. Tape: Aluminum foil-scrim tape imprinted with listing information.
    b. Minimum Tape Width: 3 inches.

c. Heat-Sensitive Imprint: Printed indicator on tape to show proper heating during application has been achieved.
d. Water resistant.
e. Mold and mildew resistant.

3. Two-Part Tape Sealing System: Comply with UL 181A; imprinted by the manufacturer with the coding "181A-M," the manufacturer's name, and a date code.

a. Tape: Woven glass fiber impregnated with mineral gypsum.
b. Minimum Tape Width: 3 inches.
c. Sealant: Modified styrene acrylic.
d. Water resistant.
e. Mold and mildew resistant.
f. Sealant shall have a VOC content of 420 g/L or less.
g. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Fabrication:

1. Select joints, seams, transitions, elbows, and branch connections and fabricate according to **SMACNA's "Fibrous Glass Duct Construction Standards," Chapter 2, "Specifications and Closure," and Chapter 4, "Fittings and Connections."**
2. Fabricate 90-degree mitered elbows to include turning vanes.
3. Reinforcements: Comply with requirements in **SMACNA's "Fibrous Glass Duct Construction Standards," Chapter 5, "Reinforcement"** for channel- and tie-rod reinforcement materials, spacing, and fabrication.
4. Preformed Round Duct: Comply with NAIMA AH116, "Fibrous Glass Duct Construction Standards," Section VII, "Preformed Round Duct."

2.2 PHENOLIC-FOAM DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. AQC Industries; Q Duct.
2. Kingspan Insulation Limited.

B. Duct Panel: CFC-free phenolic-foam bonded on both sides with factory-applied 0.001-inch-thick, aluminum foil reinforced with fiberglass scrim.

1. Maximum Temperature: 158 deg F inside ducts or ambient temperature surrounding ducts.
2. Maximum Thermal Conductivity: **0.20 Btu x in./h x sq. ft. x deg F** at 75 deg F mean temperature.
3. Permeability: 0.0002 perms maximum when tested according to ASTM E 96/E 96M, Procedure A.

4. Antimicrobial Agent: Compound shall be tested for efficacy by an NRTL, and registered by the EPA for use in HVAC systems.
5. Noise-Reduction Coefficient: 0.65 minimum when tested according to ASTM C 423, Mounting A.
6. Required Markings: UL label and other markings required by UL 181 on each full sheet of duct panel; UL ratings for closure materials.

C. Closure Materials:

1. V-Groove Adhesive: Silicone.

    a. Sealant shall have a VOC content of 420 g/L or less.
    b. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2. Pressure-Sensitive Tape: Comply with UL 181A; imprinted by the manufacturer with the coding "181A-P," the manufacturer's name, and a date code.

    a. Tape: Aluminum foil tape imprinted with listing information.
    b. Minimum Tape Width: 3 inches.
    c. Water resistant.
    d. Mold and mildew resistant.

3. Polymeric Sealing System:

    a. Structural Membrane: Woven glass fiber.
    b. Minimum Tape Width: 3 inches.
    c. Sealant: Water based.
    d. Color: White.
    e. Water resistant.
    f. Mold and mildew resistant.
    g. Sealant shall have a VOC content of 420 g/L or less.
    h. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

D. Fabrication:

1. Fabricate joints, seams, transitions, reinforcement, elbows, branch connections, access doors and panels, and damage repairs according to Knauf Insulation's "Knauf KoolDuct System Design Guide," Section 4, "Duct Construction," and Section 5, "Ductwork System General."
2. Fabricate 90-degree mitered elbows to include turning vanes.

2.3 THERMOSET FRP DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, **available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**:

1. McGill AirFlow LLC.
2. Perry Fiberglass Products, Inc.
3. Spunstrand Inc.

B. Duct and Fittings:

1. Thermoset FRP Resin: Manufacture duct with resin that complies with UL 181, Class 1, maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested by an NRTL according to ASTM E 84.
2. Inner Liner: FSK liner rated by an NRTL to comply with UL 181, Class 1.
3. Round Duct: ASTM D 2996, Type I, Grade 2, Class E, filament-wound duct, minimum **0.125-inch** wall thickness, with tapered bell and spigot ends for adhesive joints, or plain ends with couplings.
4. Round Fittings: Compression or spray-up/contact, molded of same material, pressure class, and joining method as duct.
5. Rectangular Fittings: Minimum **0.125-inch-**thick flat sheet with fiberglass roving and resin-reinforced joints and seams.
6. Double-Wall Insulated Duct: Inner and outer duct complying with requirements for "Round Duct" description above. Polyurethane foam or isocyanurate insulation with maximum thermal conductivity of **0.14 Btu x in./h x sq. ft. x deg F** at 75 deg F mean temperature.

C. Joining Materials: Roving and polyester resin.

1. Fiberglass adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Fabrication:

1. Fabricate joints, seams, transitions, reinforcement, elbows, branch connections, and access doors and panels according to SMACNA's "Thermoset FRP Duct Construction Manual," Chapter 7, "Requirements."
2. Fabricate 90-degree rectangular mitered elbows to include turning vanes, 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

E. Drains: Formed drain pockets with a minimum of NPS 1 threaded pipe connections.

2.4 PVC DUCTS AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. General Plastics, Inc.
2. GPK Products, Inc.
3. Harvel Plastics, Inc.
4. Kroy Industries, Inc.
5. Northern Pipe Product Inc.; an Otter Tail company.
6. Plastinetics Inc.
7. Spears Manufacturing Company.

B. Duct and Fittings:

1. Round Duct: Comply with cell Classification 12454-B in ASTM D 1784, with external loading properties of ASTM D 2412.
2. Round Fittings: Socket end molded of same material, pressure class, and joining method as duct.
3. Rectangular Fittings: Minimum **0.125-inch**-thick flat sheet with heat-formed corners and continuous welded butt joints.

C. Joining Materials: PVC solvent cement complying with ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesive primer shall have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Fabrication:

1. Fabricate joints, seams, transitions, reinforcement, elbows, branch connections, and access doors and panels according to SMACNA's "Thermoplastic Duct (PVC) Construction Manual," Chapter 3, "Standards of Construction for PVC Duct Systems."
2. Fabricate 90-degree rectangular mitered elbows to include turning vanes, 90-degree round elbows with a minimum of three segments for 12 inches and smaller and a minimum of five segments for 14 inches and larger.

E. Drains: PVC drain pockets with a minimum of NPS 1 threaded PVC pipe connections.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables: [**ASTM A 603, galvanized**] [**ASTM A 492, stainless**] steel with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

G. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Install ducts with fewest possible joints.

B. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

C. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

D. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

E. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges. Overlap openings on four sides by at least 1-1/2 inches.

F. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 23 33 00 "Air Duct Accessories" for fire and smokedampers.

G. Protect duct interiors from the moisture, construction debris and dust, and other foreign materials. **Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."**

H. Install fibrous-glass ducts and fittings to comply with **SMACNA's "Fibrous Glass Duct Construction Standards**."

I. Install foam ducts and fittings to comply with manufacturer’s installation instructions.

J. Install thermoset FRP ducts and fittings to comply with SMACNA's "Thermoset FRP Duct Construction Manual."

K. Install PVC ducts and fittings to comply with SMACNA's "Thermoplastic Duct (PVC) Construction Manual."

3.2 HANGER AND SUPPORT INSTALLATION

A. Install hangers and supports for fibrous-glass ducts and fittings to comply with **SMACNA's "Fibrous Glass Duct Construction Standards," Chapter 6, "Hangers and Supports."**

B. Install hangers and supports for phenolic-foam ducts and fittings to comply manufacturer's installation instructions.

C. Install hangers and supports for thermoset FRP ducts and fittings to comply with SMACNA's "Thermoset FRP Duct Construction Manual," Chapter 7, "Requirements."

D. Install hangers and supports for PVC ducts and fittings to comply with SMACNA's "Thermoplastic Duct (PVC) Construction Manual," Chapter 3, "Standards of Construction for PVC Duct Systems."

E. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 SEISMIC-RESTRAINT-DEVICE INSTALLATION

A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with [**SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."**] [**ASCE/SEI 7.**]

1. Space lateral supports a maximum of [**40 feet**] <**Insert dimension**> o.c., and longitudinal supports a maximum of [**80 feet**] <**Insert dimension**> o.c.
2. Brace a change of direction longer than 12 feet.

B. Select sizes of components so strength will be adequate to carry present and future static and seismic loads within restraint device capacity.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install cable restraints where ducts are suspended with vibration isolators.

E. Install seismic-restraint devices using methods approved by [**an evaluation service member of the ICC Evaluation Service**] [**the Office of Statewide Health Planning and Development for the State of California**] [**an agency acceptable to authorities having jurisdiction**].

F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure to flanges of beams, to upper truss chords of bar joists, or to concrete members.

G. Drilling for and Setting Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.4 PAINTING

A. Paint interior of [**thermoset FRP**] [**and**] [**PVC**] ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.5 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
b. Supply Ducts with a Pressure Class of [**2-Inch wg**] [**3-Inch wg**] [**4-Inch wg**] <**Insert value**> or Higher: Test representative duct sections[**, selected by Architect from sections installed,**] totaling no less than [**50**] [**100**] <**Insert value**> percent of total installed duct area for each designated pressure class.
c. Return Ducts with a Pressure Class of [**2-Inch wg**] [**3-Inch wg**] [**4-Inch wg**] <**Insert value**> or Higher: Test representative duct sections[**, selected by**

Architect from sections installed,] totaling no less than [**50**] [**100**] <**Insert value**> percent of total installed duct area for each designated pressure class.

d. Exhaust Ducts with a Pressure Class of [**2-Inch wg**] [**3-Inch wg**] [**4-Inch wg**] <**Insert value**> or Higher: Test representative duct sections[**, selected by Architect from sections installed,**] totaling no less than [**50**] [**100**] <**Insert value**> percent of total installed duct area for each designated pressure class.

e. Outdoor Air Ducts with a Pressure Class of [**2-Inch wg**] [**3-Inch wg**] [**4-Inch wg**] <**Insert value**> or Higher: Test representative duct sections[**, selected by Architect from sections installed,**] totaling no less than [**50**] [**100**] <**Insert value**> percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give [**seven**] <**Insert number**> days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of nonmetal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

D. Duct system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 DUCT CLEANING

A. Clean [**new**] [**and**] [**existing**] duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch duct as recommended by duct manufacturer. Comply with Section 23 33 00 "Air DuctAccessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.

2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
2. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of ducts or duct accessories.
3. Clean fibrous-glass duct with HEPA vacuuming equipment; do not permit duct to get wet. Replace fibrous-glass duct that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
4. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
5. Provide drainage and cleanup for wash-down procedures.
6. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.7 START UP

A. Air Balance: Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC."

3.8 DUCT SCHEDULE

A. Indoor Ducts and Fittings:

1. Fibrous-Glass Rectangular Ducts and Fittings:

a. Minimum Flexural Rigidity: EI-[**475**] [**800**] [**1400**].

b. Minimum Board Thickness: [**1 inch**] [**1-1/2 inches**] [**2 inches**].

2. Fibrous-Glass Round Ducts and Fittings:

a. Minimum Thickness: [**1 inch**] <**Insert thickness**>.

3. Phenolic-Foam Rectangular Ducts and Fittings:

a. Minimum Panel Thickness: [**7/8 inch**] [**1-3/32 inches**].
b. Aluminum Cladding: Minimum 0.025 inch thick.

B. Outdoor Duct and Fittings:

1. Phenolic-Foam Rectangular Ducts and Fittings:

a. Minimum Panel Thickness: [**7/8 inch**] [**1-3/32 inches**].
b. Aluminum Cladding: Minimum 0.032 inch thick.
c. Polymeric Sealing System: Coat ducts, including gang-nail couplings, grip flanges, and couplings.

2. Thermoset FRP Round Ducts and Fittings:

a. Double-Wall Insulated Ducts: Minimum [**5/8-inch**] [**7/8-inch**] insulation thickness.

3. PVC Round Ducts and Fittings:

C. Underground Ducts:

1. Thermoset FRP Round Ducts and Fittings:

a. Insulation Thickness: [**1 inch**]
b. Drain: Minimum NPS 1 PVC pipe with P-trap to air-gap drain.

2. PVC Round Ducts and Fittings:

a. Drain: Minimum NPS 1 PVC pipe with P-trap to air-gap drain.

END OF SECTION 23 31 16

SECTION 23 34 23 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Utility set fans.
2. Centrifugal roof ventilators.
3. Centrifugal wall ventilators.
4. Ceiling-mounted ventilators.
5. In-line centrifugal fans.
6. Propeller fans.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For unit hangars and supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

D. Design Calculations: Calculate requirements for selecting vibration isolators [**and seismic restraints**] and for designing vibration isolation bases.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

1.5 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 UTILITY SET FANS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Aerovent; a division of Twin City Fan Companies, Ltd.
3. Carnes Company.
4. Greenheck Fan Corporation.
5. Loren Cook Company.
6. PennBarry.

B. Housing: Fabricated of aluminum or steel, as scheduled, with continuously welded seams for leakproof operation.

1. Housing Discharge Arrangement: Adjustable to eight standard positions.

C. Fan Wheels: Single-width, single inlet; blades continuously welded to the backplate and spun inlet shroud, with hub keyed and securely attached to the fan shaft.

1. Blade Materials: Aluminum.
2. Blade Type: Forward curved.

D. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.

E. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours.

1. Extend grease fitting to accessible location outside of unit.

F. Belt Drives:

1. Factory mounted, with final alignment and belt adjustment made after installation
2. Service Factor Based on Fan Motor Size: **1.5**.

3. Motor Pulleys: Adjustable pitch for use with motors through **5** hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
4. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
5. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories: Refer to Fan Schedule on plans.

H. Capacities and Characteristics: Refer to Fan Schedule on plans.

2.2 CENTRIFUGAL ROOF VENTILATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Aerovent; a division of Twin City Fan Companies, Ltd.
3. Carnes Company.
4. Greenheck Fan Corporation.
5. Loren Cook Company.
6. PennBarry.

B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with aerodynamic aluminum inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
2. Hinged Subbase: Factory welded with hinge, locking hasp permitting service and maintenance, with galvanized aircraft cable to support fan in open an open position.

C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories: Refer to Fan Schedule on plans.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Refer to Fan Schedule on plans for additional information.

G. Capacities and Characteristics: Refer to Fan Schedule on plans.

2.3 CENTRIFUGAL WALL VENTILATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Aerovent; a division of Twin City Fan Companies, Ltd.
3. Carnes Company.
4. Greenheck Fan Corporation.
5. Loren Cook Company.
6. PennBarry.

B. Housing: Heavy-gage, removable, spun-aluminum, dome top and outlet baffle; aerodynamic aluminum inlet cone.

C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
5. Fan and motor isolated from exhaust airstream.

E. Accessories: Refer to Fan Schedule on plans.

F. Capacities and Characteristics: Refer to Fan Schedule on plans.

2.4 CEILING-MOUNTED VENTILATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. ACME Engineering and Manufacturing Company.
2. Carnes Company.
3. Greenheck Fan Corporation.
4. Loren Cook Company.

B. Housing: Steel, lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

D. Grille: Painted steel or aluminum (as scheduled) grille with flange on intake and thumbscrew attachment to fan housing.

E. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

F. Accessories: Refer to Fan Schedule on plans.

G. Capacities and Characteristics: Refer to Fan Schedule on plans.

2.5 IN-LINE SQUARE CENTRIFUGAL FANS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Carnes Company.
3. Greenheck Fan Corporation.
4. Loren Cook Company.
5. PennBarry.

B. Housing: Bolted and welded construction with corrosion resistant fasteners. 18 gauge steel construction with airflow straightening vanes and integral duct flanges.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing. Hinged access door shall be located in specified position.

D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing. Regreasable ball type bearings pillow block cast iron housing selected for a minimum L-50 life in excess of 200,000 hours at maximum cataloged operating speed.

E. Fan Wheels: Backward inclined aluminum with machined cast aluminum hub and aerodynamic aluminum inlet cone.

F. Accessories: Refer to Fan Schedule on plans.

G. Capacities and Characteristics: Refer to Fan Schedule on plans.

2.6 PROPELLER FANS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Acme Engineering & Manufacturing Corp.
2. Aerovent; a division of Twin City Fan Companies, Ltd.
3. Carnes Company.
4. Loren Cook Company.
5. PennBarry.

B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

D. Fan Wheel: Replaceable, extruded-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

E. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

F. Fan Drive:

1. Resiliently mounted to housing.
2. Statically and dynamically balanced.
3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
4. Extend grease fitting to accessible location outside of unit.
5. Service Factor Based on Fan Motor Size: 1.5.
6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.

    a. Ball-Bearing Rating Life: ABMA 9, L_{50} of 200,000 hours.

8. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
9. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
10. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
11. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories: Refer to Fan Schedule on plans.

H. Capacities and Characteristics: Refer to Fan Schedule on plans.

2.7 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

B. Enclosure Type: Totally enclosed, fan cooled.

2.8 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment Mounting:

1. Install power ventilators on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete." and Section 033053 "Miscellaneous Cast-in-Place Concrete."
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 23 05 48 "Vibration and Seismic Controls for HVAC."
3. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13 "Vibration Controls for HVAC."

B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 07 72 00 "Roof Accessories" for installation of roof curbs.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Section 23 05 53 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 23 33 00 "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Section 23 05 93 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 23 81 26 – SPLIT SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes split-system air-conditioning and heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:

1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.

1. Warranty Period:

a. For Compressor: Five year(s) from date of Substantial Completion.
b. For Parts: Five year(s) from date of Substantial Completion.
c. For Labor: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Carrier Air Source Heat Pump Series

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Concealed Evaporator-Fan Components:

1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
2. Insulation: Faced, glass-fiber duct liner.
3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
4. Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch; leak tested to 300 psig underwater; with a two-position control valve.
5. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
6. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
7. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 05 13 "Common MotorRequirements for HVAC Equipment."
b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
c. Wiring Terminations: Connect motor to chassis wiring with plug connection.

8. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
9. Filters: Permanent, cleanable.
10. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
2) Depth: A minimum of 2 inches deep.

b. Single-wall, stainless-steel sheet.
c. Double-wall, stainless-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
d. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

1) Minimum Connection Size: NPS 1.

B. Wall-Mounted, Evaporator-Fan Components:

1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
4. Fan: Direct drive, centrifugal.
5. Fan Motors:

a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 23 05 13 "Common MotorRequirements for HVAC Equipment."
b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
c. Enclosure Type: Totally enclosed, fan cooled.
d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
f. Mount unit-mounted disconnect switches on exterior of unit.
g. .

6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
7. Condensate Drain Pans:

a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.

1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.

2) Depth: A minimum of 1 inch deep.

b. Single-wall, stainless-steel sheet.
c. Double-wall, stainless-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
d. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.

1) Minimum Connection Size: NPS 1.

e. Pan-Top Surface Coating: Asphaltic waterproofing compound.

2.3 OUTDOOR UNITS

A. Air-Cooled, Heat Pump Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.

a. Compressor Type: Scroll.
b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
c. Refrigerant: R-410A.
d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.

3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to -13 deg F.
7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Thermostat: Low voltage with subbase to control compressor and evaporator fan.

B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:

1. Compressor time delay.
2. 24-hour time control of system stop and start.
3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
4. Fan-speed selection including auto setting.

C. Automatic-reset timer to prevent rapid cycling of compressor.

D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

E. Drain Hose: For condensate.

F. Monitoring:

1. Monitor constant and variable motor loads.
2. Monitor variable-frequency-drive operation.
3. Monitor economizer cycle.
4. Monitor cooling load.
5. Monitor air distribution static pressure and ventilation air volumes.

2.5 CAPACITIES AND CHARACTERISTICS

A. See Drawing “HVAC Schedules”

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounted, compressor-condenser components on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

D. Equipment Mounting:
1. Install ground-mounted, heat pump components on polyethylene mounting base.
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 23 05 48 "Vibration and Seismic Controls for HVAC."
3. Comply with requirements for vibration isolation devices specified in Section 23 05 48.13" Vibration Controls for HVAC."

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

C. Duct Connections: Duct installation requirements are specified in Section 23 31 13 "Metal Ducts."Drawings indicate the general arrangement of ducts. Connect supply[**and return**] ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specifiedin Section 23 33 00 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 23 81 26

SECTION 23 82 19 - FAN COIL UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ductless fan coil units and accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include diagrams for power, signal, and control wiring.

B. Samples: For units with factory-applied color finishes.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale and coordinated with each other based on input from installers of the items involved:

B. Seismic Qualification Certificates: For fan coil units, accessories, and components, from manufacturer.

C. Field quality-control reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Factory-packaged and -tested units rated according to AHRI 440, ASHRAE 33, and UL 1995.

2.2 FAN COIL UNITS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Daikin Applied.
2. Carrier Corporation; a unit of United Technologies Corp.
3. ENVIRO-TEC; by Johnson Controls, Inc.
4. Greenheck Fan Corporation.
5. IEC (International Environmental Corporation); LSB Industries.
6. Trane Inc.
7. YORK; a Johnson Controls company.

B. Fan Coil Unit Configurations: Refer to Fan Coil Unit Schedule on plans.

C. Coil Section Insulation: **1/2-inch**-thick, **closed-cell foam** complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.

1. Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.
2. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Drain Pans: Insulated galvanized steel. Fabricate pans and drain connections to comply with ASHRAE 62.1. Drain pans shall be field reversible for left hand or right hand configuration.

E. Chassis: Galvanized steel. Floor-mounting units shall have leveling screws.

F. Cabinet: Concealed units constructed of 18-gage galvanized steel. Exposed units constructed 18-gage galvannealed steal with factory powder coating.

G. Filters: Minimum arrestance and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2 and all addendums. Refer to Fan Coil Unit Schedule on plans for additional information.

H. Hydronic Coils: Copper tube[**with corrosion-resistant coating**], with mechanically bonded aluminum fins spaced no closer than 0.1 inch, rated for a minimum working pressure of 200 psig

and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.

I. Corrosion-Resistant Coating: Coat coils with a corrosion-resistant coating capable of withstanding a [**3,000**] <**Insert time**>-hour salt-spray test according to ASTM B 117.

1. Standards:

a. ASTM B 117 for salt spray.
b. ASTM D 2794 for minimum impact resistance of 100 in-lb
c. ASTM D 3359 for cross hatch adhesion of 5B.

2. Application: [**Immersion**] [**Spray**].
3. Thickness: [**1 mil**] <**Insert measurement**>.
4. Gloss: Minimum gloss of 50 gloss units on a single angle 60 degree meter.
5. UV Protection: Spray applied topcoat.

J. Electric-Resistance Heating Coils: Nickel-chromium heating wire, free of expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

K. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.

L. Control devices and operational sequences are specified in Section 23 09 00 " Instrumentation, Controls and Sequences of Operation for HVAC"

M. Electrical Connection: Factory wire motors and controls for a single electrical connection.

N. Capacities and Characteristics: Refer to Fan Coil Unit Schedule on plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fan coil units level and plumb.

B. Install fan coil units to comply with NFPA 90A.

C. Suspend fan coil units from structure with elastomeric hangers. Vibration isolators are specified in Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment."

D. Install new filters in each fan coil unit within two weeks after Substantial Completion.

E. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

1. Install piping adjacent to machine to allow service and maintenance.
2. Connect condensate drain to indirect waste.

    a. Install condensate trap of adequate depth to seal against fan pressure. Install cleanouts in piping at changes of direction.

F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections[**with the assistance of a factory-authorized service representative**]:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.3 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to [**two**] <**Insert number**> visits to Project during other-than-normal occupancy hours for this purpose.

END OF SECTION 23 82 19

SECTION 23 82 39 – ELECTRIC WALL AND CEILING HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, and details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include details of anchorages and attachments to structure and to supported equipment.
4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
5. Wiring Diagrams: Power, signal, and control wiring.

C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Reznor HVAC
2. Markel Products; TPI Corporation.
3. QMark; Marley Engineered Products.

2.2 DESCRIPTION

A. Assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 CABINET

A. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.

B. Finish: Baked enamel over baked-on primer with manufacturer's [**standard**] [**custom**] color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.

C. Surface-Mounted Cabinet Enclosure: Steel with finish to match cabinet.

2.4 COIL

A. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and 60-Hz hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high-temperature protection.[**Provide integral circuit breaker for overcurrent protection.**]

2.5 FAN AND MOTOR

A. Fan: Aluminum propeller directly connected to motor.

B. Motor: Permanently lubricated. Comply with requirements in Section 23 05 13 "Common MotorRequirements for HVAC Equipment."

2.6 CAPACITIES AND CHARACTERISTICS

A. Refer to Electric Heater Schedule on plans.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wall and ceiling unit heaters to comply with NFPA 90A.

B. Install wall and ceiling unit heaters level and plumb.

C. Install wall-mounted thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

D. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 23 82 39.19

SECTION 25 30 00 - INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work of this section consists of furnishing and installing freestanding instrument panels, wall mounted instrument panels, main control panels, panel mounted instruments and devices, and field mounted instruments and devices. Coordinate installation of instrumentation with Engineer. All instruments and control panels shall be designed and installed for corrosive environment with washdown service.

B. Provide all necessary equipment and materials required to streamline future hookup of Well 11.

C. Control equipment and associated programing listed as "By Others" will be installed and completed by the Town's SCADA Contractor *Control Systems Technology, Inc* (CST) of Idaho Falls, ID. Contract information for CST is provided below.

Mike Wareing
Control System Technology, Inc.
5471 Heyrend Dr.
Idaho Falls, ID 83402
(208) 523-2796
mwareing@controlsys.com

Contractor shall work closely with CST to complete required work to provide a successful operating system. In general, CST will provide control equipment (PLC, meters, pressure transducers, building sensors, communication radios, I/O modules, electrical actuated solenoid valves, etc.) and Contractor shall install devices, which includes installing conduit to devices and pulling all equipment control wires from the equipment to PLC-100; conduit and wire/cable sizes shall be coordinated with CST. Product requirements in the specification are the responsibility of CST unless noted herein that it is required by Contractor.

More specifics are provided in Section 25 51 00.

D. Any concealed (in-wall or below slab) conduits serving future controls for Well 11 shall be installed by Contractor for future use by Owner.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 – Grounding and Bonding for Electrical Systems

B. Section 03 30 00 - Cast In Place Concrete

C. Section 03 60 00—Grouting

D. Section 05 51 16 – Metal Fabrications

E. Section 06 62 00 - Flashing and Sheet Metal

F. Section 09 90 00 - Painting and Coating

G. Section 25 51 00 – Integrated Automation Control of Facility Equipment

H. Division 26 - Electrical

I. Division 40 - Process Integration

K. Division 46 – Water and Wastewater Equipment

1.3 REFERENCES

A. ISA S5.1—Instrumentation symbols

B. ISA S5.4—Instrument Loop Diagrams

C. ISA RP7.1—Color Code for panel tubing

D. IEEE—All applicable standards

E. NEMA ICS1—General Standards for Industrial Controls and Systems

F. NEMA 2—Industrial Control Devices, Controllers and Assemblies

G. NEMA 3—Industrial Systems

H. NEMA ICS6—Enclosures for Industrial Control and Systems

I. NEMA 250—Enclosures for Electrical Equipment

J. UL—All applicable sections

K. NFPA 70—National Electrical Code

1.4 DEFINITIONS

A. Process and Instrument Diagram (P&ID) or Connections Diagram: A process or flow diagram is a conceptual diagram of the functional interrelationship of subsystems in block or pictorial form. P&ID drawings for existing and proposed equipment and controls have been provided in the project plans.

B. Schematic Diagram or Elementary Diagram: A schematic or elementary diagram is one that shows all circuits and device elements of a system or piece of equipment and its associated apparatus or any clearly defined functional portion thereof. Such a diagram emphasizes the device elements of a circuit and their functions as distinguished from the physical arrangement of the conductors, devices or elements of a circuit system

C. Wiring Diagram or Connection Diagram: A wiring or connection diagram is one that locates and identifies electrical devices, terminals, and interconnecting wiring in an assembly. This diagram shall be in a form showing interconnecting wiring by lines or indicating interconnecting wiring only be terminal designations

D. Interconnecting Diagram: An interconnection diagram is one that shows only the external connections between controllers, control panels, and associated machinery and equipment

E. Dimension or Outline Drawing: A dimension or outline drawing (base plan, floor plan, and so forth) is one that shows the physical space and mounting requirements of a piece of equipment. It shall be permitted to also indicate ventilation requirements and space provided for connections or the location to which connections are to be made

F. One-Line Diagram (Single-Line): A one-line or single-line diagram is one that shows, by means of single lines and graphic symbols, the course of an electrical circuit or circuits and the component devices or parts used therein. Physical relationships are usually disregarded

G. Logic Diagram: A logic diagram is a particular form of one-line or single-line diagram of a logic circuit using logic symbols

H. Block Diagram: A block diagram is made up of a group of interconnected blocks, each of which represents a device or subsystem

I. Loop Diagram: A loop diagram is a collection of all components of an individual instrumentation system, or loop, showing the field, junction, panel rear and front connection points and all associated equipment

J. Wireless Connection Diagram: The general physical arrangement of devices in control equipment and connections between these devices, terminals, and terminal boards for outgoing connections to external apparatus. Connections are shown in tabular form and not by lines. An elementary (or schematic) diagram may be included in the connection diagram

1.5 SYSTEM INTERFACE COORDINATION

A. Provide all buffers, isolators, signal converters and amplifiers for interfacing with proposed and existing equipment, equipment furnished under other sections, and between items of equipment furnished hereunder, whether or not such interfacing is indicated on the Drawings or detailed specification

1.6 DESIGN REQUIREMENTS

A. Equipment Interfacing:
   1. Analog signals from equipment under this Section: 4 to 20 milliamperes direct current (DC), negative ground for a total loop impedance of 0 to 500 ohms
   2. Analog signals from equipment under other Section: 4 to 20 milliamperes DC, negative ground, suitable for 100 to 500 ohms loop impedance
   3. Provide all required buffers, isolators, signal converters, and amplifiers for coordination with existing equipment, equipment furnished under another Section, and

between items of equipment furnished hereunder, whether or not indicated on the Drawings or detailed Specifications

B. Power Supply:
   1. Contractor shall provide all required power conversion equipment for operation of all electric and electronic items from a 120 volt alternating current (AC) plus or minus 12 volts AC power supply source.
   2. Provide isolation transformers in each instrument panel to supply all panel loads except lighting

1.7 PERFORMANCE REQUIREMENTS

A. General:
   1. Items will perform to limits of Manufacturer's published accuracy

B. Metering Accuracy:
   1. Pressure: Error within 1 percent of the total head imposed on the measuring element
   2. Level: Error within 1 percent of the measured range
   3. Flow: Agreement of the measuring system with the flow/head curves of the different producers within 2 percent over a 5-to-1 range for control and 8-to-1 range for instrumentation

C. Modulating Control:
   1. Range: Stable performance over a 6-to-1 operating range with an accuracy within 2 percent over a 5-to-1 range
   2. Stability: After controls have taken corrective action, as a result of a change in load or set point, the oscillations of a controlled element does not exceed 2 cycles per minute
   3. Response: Any change in rate setting produces a corresponding change in the final element and becomes stable within 30 seconds
   4. Agreement: Variable indicators and rate setting indicators agree within 3 percent of full scale over a 6 to 1 operating range
   5. Sensitivity: During stable performance, instrument pointer or pen oscillations within 1 percent of scale

1.8 SUBMITTALS

A. As specified in Section 01 33 23 Submittal Procedures

B. Made in the name of the responsible supplier of the system

C. Shop Drawings and Product Data:
   1. Complete fabrication, assembly and installation drawings
   2. Schematic, wiring, and connection diagrams
   3. Dimension and outline drawings
   4. Loop diagrams
   5. Details, specifications, and data describing instruments, materials, devices, and accessories

6. Differential producers:
    a. Certified standard calibration curve
    b. Cover the entire specified range
    c. Calibration curve legible to 0.5 percent of flow
7. Environmental requirements:
    a. Temperature
    b. Minimum and maximum flow or pressures
8. Accuracy and repeatability:
    a. Individual components
    b. Total system
9. Calibration requirements:
    a. Initial
    b. Periodic
10. Power requirements

D. Samples:
    1. Manufacturer's standard panel colors for selection by Engineer/Owner
    2. Two sets of 8 inch by 10 inch color photographs or each freestanding panel showing front and interior views taken after fabrication, assembly, and painting

E. Test Reports:
    1. Instrument record calibration sheet
    2. Instrument loop record sheet

F. Manufacturers Instructions

1.9 PROJECT RECORD DOCUMENTS

A. As specified in Section 01 77 00

B. As-configured loop record sheets

C. As-calibrated instrument calibration sheets

D. As-built vendor drawings:
    1. Electronic copy, .pfd format
    2. AutoCAD® Release 20010 drawing files or more recent release

E. Red-lined Contract Documents

F. Submit under provisions of Section 01 77 00

1.10 OPERATION AND MAINTENANCE

A. As specified in Section 01 78 23

B. Operation Data: Complete and detailed instruction manual

C. Maintenance Data:
   1. Recommended spare parts list
   2. Preventative maintenance schedule
   3. Calibration schedule and detailed calibration instructions

1.11 QUALITY ASSURANCE

A. Equipment designed, coordinated and supplied by a single responsible manufacturer or supplier of both electrical and system components

1.12 QUALIFICATIONS

A. Acceptable Suppliers:
   1. Designed, coordinated, and supplied by a single responsible Manufacturer or supplier of both electrical and pneumatic metering and control systems
   2. Five years minimum experience in installing instrumentation systems

1.13 REGULATORY REQUIREMENTS

A. Underwriters Laboratories

B. National Fire Protection Association

1.14 PRE-INSTALLATION CONTROLS CONFERENCE

A. Convene within 60 days after Notice to Proceed, and before development and submittal of shop Drawings, under provisions of Section 01 31 00

B. Conference will be used to discuss requirements of this Section, as well as requirements of Divisions 25, 26, 43, and 46.

C. Present written request for clarifications to the Engineer.

1.15 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site under provisions of Section 01 67 00

B. Store and protect products under provisions of Section 01 67 00

C. Accept products on site in factory containers and verify condition of product

1.16 ENVIRONMENTAL REQUIREMENTS

A. Do not install instruments until spaces are suitably protected from weather, moisture, and damage from other trades

B. Maintain protection of instruments during and after installation

C. Any items damaged during construction will be repaired or replaced at the Project Engineer's discretion

1.17 FIELD MEASUREMENTS

A. All field measurements are to be verified and indicated on shop Drawings

1.18 SEQUENCING

A. Sequence Work under the provisions of Section 01 31 00

1.19 COORDINATION

A. Coordinate the Work under provisions of Section 01 31 00

B. Coordinate requirements of the Work with the electrical Contractor and schedule any required shutdowns with General Contractor

1.20 WARRANTY

A. Work shall be performed under the Contractor's warranty, correction shall be performed by employees of the instrument supplier, or of an authorized agency

1.21 MAINTENANCE MATERIALS

A. Provide spare parts under provisions of Section 01 77 00

B. Do not provide or purchase analytical buffer solutions until one month prior to scheduled equipment operation

C. Provide spare parts:
1. 25 percent replacement bulbs for indicator pilot lamps
2. 100 percent replacement fuses
3. 10 percent replacement pilot light lenses
4. 10 percent replacement step-down transformers for low voltage indicator pilot lamps

D. Tools:
1. One fuse puller of each size and type required
2. One active and 1 spare corrosion inhibitor capsule for each outdoor enclosure

PART 2 **PRODUCTS**

2.1 INSTRUMENT AND CONTROL PANELS **(BY OTHERS)**

A. Wall Mounted Enclosures:
1. Materials:
a. Front: 14 gauge minimum steel plate
b. Sides, top and doors: 14 gauge steel

c. Rating:
1) **Indoor, wet environment NEMA 3X**, unless otherwise specified
2) Indoor, controlled environment: NEMA 12, unless otherwise specified
3) Indoor, corrosive environment: NEMA 4X, unless otherwise specified
4) Indoor, hazardous environment: NEMA 7, unless otherwise specified
5) Outdoor: NEMA 3X or 4, unless otherwise specified

d. Door Clamps: Stainless Steel

2. Fabrication:
a. Dimensions as indicated on Drawings, or as required for the equipment specified
b. Indoor, wall mounted, protecting components from dust, dirt, oil and water
c. Doors:
1) Approx. full height
2) Heavy gauge continuous hinge pin
3) Door and body stiffeners in larger panels
4) Turned back edges
5) Data pocket

d. All welds ground smooth
e. Front free of waves and other imperfections
f. Finish:
1) Rust inhibitive primer
2) Three finish coats, minimum
3) Interior enclosure and subpanel color: grey
4) Exterior panel color: ANSI 61 gray polyester power coating over phosphatized surface, unless otherwise specified
5) Instrument panel quality finish

3. Manufacturers:
a. Hoffman
b. Weigman
c. Control Engineering Co.
d. Substitutions: Section 01 67 00 - Product Requirements

B. Free Standing Enclosures:
1. Materials:
a. Front: 10 gage minimum steel plate
b. Sides, tops, and doors: 10 gage steel
c. Bases: Heavy channel iron

2. Rating:
a. Indoor, controlled environment: NEMA 12, unless otherwise specified
b. Indoor, corrosive environment: NEMA 4X, unless otherwise specified
c. Outdoor: NEMA 4, unless otherwise specified
d. Door Clamps: Stainless Steel

3. Fabrication:
a. Dimensions as indicated on Drawings or as required for the equipment specified
b. Indoor, protecting components from dust, dirt, oil and water

c. Rigidly braced and reinforced to support instruments

4. Doors:
   a. Approximate full height of vertical section
   b. Heavy gage continuous hinge pin
   c. Positive 3-point latches
   d. Door and body stiffeners in larger panels
   e. Turned back edges
   f. Additional bracing as required for rigidity
   g. Data pocket
5. Knobs, handles, and other exposed hardware: Stainless steel
6. All welds ground smooth
7. Front free of waves and other imperfections
8. Base:
   a. Channel flanges up for anchoring web to floor
   b. Slotted bolt holes, 1-1/2 inches long for field adjustment
   c. Not recessed at base
9. Finish:
   a. Rust inhibitive primer
   b. Three finish coats, minimum
   c. Interior enclosure and sub panel color: White
   d. Exterior panel color: ANSI 61 gray polyester power coating over phosphatized surface, unless otherwise specified
   e. Instrument panel quality finish
10. Manufacturers:
    a. Hoffman
    b. Anoka
    c. Minnesota
    d. Substitutions: Section 01 67 00 - Product Requirements

C. Wiring:
1. Internal instrument and device wiring:
   a. Manufacturer's standard
   b. Analog: 18 American Wire Gauge (AWG) minimum, stranded copper, twisted, shielded, with drain
   c. Digital and power: Sized for the current to be carried (14 AWG minimum), stranded copper, 600-volt, Type moisture and heat resistant thermoplastic (MTW)
2. Interconnecting wiring and wiring for external connections:
   a. Stranded copper, sized as shown in the Drawings or for the current to be carried (12 AWG minimum)
   b. 600 volts insulation
   c. Heat and moisture-resistant and flame-retardant non-metallic covering
   d. Flexible cable at hinges
3. Wiring grouped or cabled and firmly fastened to panel in vinyl wiring duct with snap-on covers. Ducts shall be sized for no more than 60 percent fill
4. All wiring identified with wire numbers as shown on the submittal Drawings.
5. Wiring protected from damage at hinges

6. Instrumentation power supply protected by fuse or circuit breaker, with fuse or circuit breaker easily accessible, and provided with isolation transformers and transient protection:
    a. Analog Signals:
        1) Manufacturers:
            a) EDCO; Model PC-642 or SRA-64
            b) M-SYSTEM; Model MDP-24-1
            c) Wieland; Model 57.806.1153.0
            d) Substitutions: Section 01 67 00 - Product Requirements
    b. 120 V AC Lines
        1) Manufacturers:
            a) EDCO; Model HSP-121
            b) M-SYSTEM; Model MH-105A (5 Amps), 110A (10 Amps), 130A (30 Amps)
            c) Wieland; Model WB.700.120
            d) Substitutions: Section 01 67 00 - Product Requirements
7. All analog or other DC circuits shall be separated by at least 6 inches from any parallel AC power or control wiring
8. Terminal blocks for panels, consoles, racks, and cabinets:
    a. Provide for external wiring:
        1) Power supply circuits
        2) Signal circuits
        3) Wire-through circuits
        4) Shielded cable shields
        5) 20 percent additional (4 minimum)
    b. Located 6 inches, minimum, above base of panel
    c. Terminal blocks shall be grouped to keep AC circuits separate from 24 volts DC circuits
    d. Size all terminal block components to allow insertion of all necessary wire sizes and types and to accommodate current to be carried
    e. Rail mounted, screw clamp compression type with marking strips and covers. Supply terminals that allow connection of wire without any preparation other than stripping
    f. Suitable for 16 AWG to 12 AWG copper conductors:
        1) Manufacturers:
            a) Allen-Bradley; Model 1492-CA1
            b) Square D; Model 9080
            c) Entrelec; Model 115-116.07
            d) Substitutions: Section 01 67 00 - Product Requirements
9. Accessories:
    a. Interior illumination:
        1) Handswitch controlled compact fluorescent light
        2) Toggle type light switch
    b. A print pocket shall be provided mounted on the inside face of the panel door
    c. All panels shall be provided with corrosion inhibiting capsules of a quantity appropriate to the panel volume

D. Device Identification:
   1. In accordance with Section 26 05 53
   2. Front Panel:
      a. Permanent descriptive nameplate on, or immediately below each front panel device
      b. Engraved phenolic plastic, white surface with black core
      c. Engraving as accepted by Engineer
      d. 1/4 inch high, all capital block letters
      e. 1 inch by 3 inch minimum
   3. Internal:
      a. All internal items permanently identified
      b. Embossed tape labels are not acceptable
      c. Wiring shall be numbered and tagged at each termination

2.2 PANEL MOUNTED INSTRUMENTS AND DEVICES **(BY OTHERS)**

A. Pilot Devices:
   1. Round pilot devices:
      a. Heavy duty, oil tight
      b. Contacts, operator types, and lamp lens colors as indicated on Drawings
      c. Lamps front replaceable
      d. 120 volt lamps, or 24 to 28 volt lamps with individual transformers or resistors, push-to-test type
      e. Contact rating; 10 amps, minimum at 120 volts AC
      f. Manufacturer:
         1) Allen-Bradley; Model 800T
         2) Substitutions: Section 01 67 00 - Product Requirements

B. Relays and Timers:
   1. 120 volts, 60 hertz coils for continuous duty in 40 degrees C ambient
   2. 10 amperes, 120 volts AC contacts
   3. Contacts, actions, ranges, and settings as indicated on Drawings
   4. Auxiliary relays:
      a. 300 volts machine tool type
      b. Convertible contacts
      c. Plug-in type relay
      d. Din-rail mounted sockets
      e. Sub panel mounted
      f. Manufacturers:
         1) Allen-Bradley; Model 700 P
         2) Idec; Model Type RR
         3) Substitutions: Section 01 67 00 - Product Requirements
   5. Time delay relays:
      a. Electronic timing
      b. Time calibrated dial head adjustment
      c. Sub panel mounted
      d. Manufacturers:

1) Allen-Bradley; Model 700 HTF
2) Idec; Model type RTE
3) Agastat; Model series SST
4) Substitutions: Section 01 67 00 - Product Requirements

6. Interval/duration (DUR) timers:
   a. Sub panel mounted
   b. Electronic timing
   c. Manufacturers:
      1) Allen-Bradley; Model 700 HV
      2) Idec; Model Type GT3W
      3) TimeMark; Model 338
      4) Substitutions: Section 01 67 00 - Product Requirements

C. Time Clocks:
   1. Stand-alone Panel
   2. Electro-mechanical
   3. Manufacturers:
      a. Tork; Model 8000
      b. INTERMATIC; Model Series T1900
      c. Paragon; Model Series 1015
      d. Substitutions: Section 01 67 00 - Product Requirements

D. Visual/Audible Alarm Device:
   1. Adjustable volume
   2. 120 V AC
   3. Manufacturer:
      a. Environment:
         1) NEMA 1:
            a) Federal Signal; Model LSH
            b) Clifford and Snell; "Yodalight" YL-40DD50RFRUL
            c) Substitutions: Section 01 67 00 - Product Requirements
         2) NEMA 3R:
            a) Federal Signal; Model 400ST
            b) Substitutions: Section 01 67 00 - Product Requirements
         3) NEMA 4X:
            a) Federal Signal; Model 121X series C
            b) Substitutions: Section 01 67 00 - Product Requirements

E. Power Supplies:
   1. Modular, plug-in, DIN rail mountable
   2. Solid state
   3. Sized for continuous operation of all equipment plus 150 percent excess capacity
   4. Input power: 120 volts AC, 60 hertz

5. Output power: As shown on the Drawings
6. Overcurrent and overvoltage protection for power supply and all components of system
7. Manufacturers:
    a. Absolute Process Instruments; Model API 9046 series, 9046-24 (24 V DC at 75 mA)
    b. Sola/Hevi-Duty; Model SDN series, SDN5-24-100 (24 V DC at 5 Amps)
    c. Idec; Model PS5R series, PS5R-E24 (24 V DC at 4 Amps)

F. Isolation Transformers:
1. Input: 120 volts AC, 60 hertz
2. Output: 120 volts AC, 60 hertz
3. VA rating to be sized 50 percent greater than required load
4. Manufacturers:
    a. Sola/Hevi-Duty; Model MCR-63-23-210-8 (120 V AC at 8 Amps)
    b. Stancor; Model GIS-1000 (120 V AC at 8 Amps)
    c. Tripp-Lite; Model IS-1000 (120 V AC at 8 Amps)

G. Uninterruptible Power Supplies (UPS):
1. Provide as indicated on the Drawings
2. Input: 120 V AC, 60 Hz
3. Output: 120 V AC, 60 Hz
4. VA sized 50 percent greater than required load
5. Power capacity sized at 60 minutes at full rated load
6. Manufacturers:
    a. APC; Model Back-UPS
    b. Sola/Hevi-Duty; Model S3000
    c. Tripp-Lite; Model BC-PRO

H. Electronic Indicators:
1. Miniature case, 1 inch by 4 inch nominal (1/8 DIN)
2. Solid state circuitry
3. Power: 120 V AC
4. Designed to function between 85 percent and 110 percent of rated voltage
5. Factory wired and tested
6. Usable with NO or NC alarm contacts
7. Accuracy: +/- 0.1 percent of span
8. LED display; 0.56 inches
9. Inputs: 4-to-20 mA
10. Manufacturers:
    a. Newport; Model 2002A-P-SPC
    b. Kissler-Ellis Products; Model Intellect-69, INT-69R
    c. Substitutions: Section 01 67 00 - Product Requirements

2.3 FIELD MOUNTED FLOW MONITORING INSTRUMENTS AND DEVICES **(BY OTHERS)**

A. Magnetic Flow Meter: **Instrument FM/FE-921, FM/FE-1021**:
   1. Indicator/Transmitter:
      a. Self-contained - Mounted on the meter
      b. Except for indicating scale and totalizer, interchangeable between magnetic flow meters
      c. Indicator and totalizer visible without opening enclosure
      d. Display: 8-line graphical blacklit
      e. NEMA 4X enclosure
      f. Power: 10-35 VDC, verify length of cable per plans.
      g. Two programmable setpoint relays, Form "C" rated at 5A resistive
      h. One Analog output; 4-to-20 mA (2 ea.) and pulse output for remote totalizer. Provide pulse frequency and alarm settings.
      i. Accuracy: +/- 0.5 percent
      j. Stability: 0.5 percent of full scale
      k. Manufacture/Make: McCrometer ProCom Converter, or equal.
   2. Sensor:
      a. Magnetic flow meter
      b. No moving parts in contact with fluid
      c. Flanged for 2" and larger, threaded with unions for smaller than 2".
      d. Suitable for 150 psi working pressure
      e. Grounding rings at each end
      f. Capable of standing empty for extended periods of flow through time without damage
      g. No constriction in or obstruction of flow through meter
      h. Weather resistant and splash-proof
      i. Encapsulated characterized field coils
      j. Range: As shown on instrument list
      k. Accuracy: 0.50% of actual flow.
      l. Repeatability: +/- 0.1 percent
      m. Temperature Range: 32-to-122 degrees F
      n. Provide spare flanged spool piece of exact laying length
   3. Provided with all communication and power supply interconnecting cables for complete operating system
   4. Manufacturer/Make: UM08 McCrometer Ultra Mag, or otherwise approved by Owner.

2.4 FIELD MOUNTED PRESSURE MONITORING INSTRUMENTS AND DEVICES **(BY OTHERS**)

A. Pressure Transmitter: **Instrument PT-011 & 012**
   1. In-line pressure transmitter with local operator interface with block-and-bleed 2-valve configuration per details in
   2. Sensor:
      a. Service: Potable Water

b. Elevation: 6120 ft
c. Housing: Stainless Stl.
d. Display: LED – alphanumeric up to 4 digits
e. Measuring Range: -14.5 to 360 psi
f. Operating Voltage: 18 to 30 DC
g. Output Signal: Tow digital and one analog output (4-20 mA HART
h. Application Pressure Range: 0 - 200 psi
i. Connection: : 1/4" NPT, female for final connection to block-and-bleed.
j. Manufacturer/Make: IFM Model PN2293, or equal.

3. Valves:
   a. Type: Block-and-bleed w/ two-way valve
   b. Construction: Stainless
   c. Service: Process air
   d. Packing Material: PTFE
   e. Connection: ½" NPT, female/male for final connection to sensor and piping manifold.
   f. Manufacturer/Model: By sensor manufacturer, Rosemount 306, or approved equal.

2.5 FIELD MOUNTED LEVEL MONITORING INSTRUMENTS AND DEVICES **(BY OTHERS)**

A. Submersible Pressure Transducer: **Instruments: PT-912, PT-1012**
   1. Pressure transducer located in casing of Well 9 and 10 to monitor groundwater levels during and outside of pumping operations.
   2. Transducer:
      a. Service: Submersible in Groundwater
      b. Level Measurement Range: 0 to 70 ft
      c. Elevation: 6120 ft
      d. Housing: Stainless Stl.
      e. Accuracy: +/-.25% of full range
      f. Temperature Range: 0 to 150 deg. F.
      g. Power: 10 to 30 Vdc
      h. Output Signal: 4 to 20 mA DC, two wire
      i. Response Time: <50 ms
      j. Mounting Orientation: Suspended in tank/well
      k. Cable Length: 2000-ft+/- (Well #9), & 150-ft+/-
      l. Manufacturer/Model: Dwyer MBLT Series, or equal.

   3. Provided with all communication and power supply interconnecting cables for complete operating system.

B. Pressure Transducer: **Instruments: PT-933, PT-953**
   1. Pressure transducer located on the discharge side of potable water booster pumps (P-933 & P-953) to chemical feed systems
   2. Manufacturer: Provided by pump mfg. per Section 43 21 13.

2.6 FIELD MOUNTED RESIDUAL CHLORINE MONITORING INSTRUMENTS (**BY OTHERS**)

A. Chlorine Analyzers:
   1. Chlorine analyzer located on the main 20-inch dia. transmission line in the well house. Sensor shall be multiparameter, capable of reading temperature, pH, conductivity, ORP, and residual (free) chlorine.
   2. Sensor: **Instruments: CLA-069**
      a. Service: In-line pressurized potable water pipe
      b. Level Measurement Range: 0 to 20 ppm Chlorine
      c. Resolution: 0.001 ppm Chlorine
      d. Maximum Working Pressure: 145 psi
      e. Measurement Interval: 60s
      f. Elevation: 6120 ft
      g. Accuracy: +/-5%
      h. Power: 24 Vdc
      i. Output Signal: 4 to 20 mA DC, two wire
      j. Mounting Orientation: Provide sensor complete with pipe saddle and restraints, corporation stop, sensor housing and all necessary parts and equipment for installation and operation.
      k. Cable Length: Verify in Plans.
      l. Manufacturer/Model: Halogen MP5-A Multiparameter Sensor, or equal.
   3. Remote Display/Controller **Panel: LCP-069**
      a. Description: Microprocessor-controlled, menu-driven controller that communicates with the sensor.
      b. Power Requirements: 85 to 240VAC ±10%, 50/60Hz; 1 A (28W sensor load)
      c. Communication:
         1) Analog: 4-20mA analog outputs
         2) Digital: Modbus RTU Standard
      d. Manufacturer/Model: Halogen D20 Display/Controller, or approved equal.

2.7 ELECTRIC ACTUATED SOLENOID VALVES (**BY OTHERS**)

A. Electric Actuated Solenoid Valves: Per Section 40 05 23.72
   1. Potable Water Flow Control to Orthphosphate System**: Instruments: SV-932, SV-1032**
   2. Potable Water Flow Control to Chlorine Disinfection System**: Instruments: SV-955, SV-1055.**

2.8 GENSET CONTROLS AND SENSORS

A. Fuel Tank Level: **Instruments: FS-110**
   1. Manufacturer**:** Per Section 26 32 13

B. Intrusion Sensors: **Instruments: XS-130. XS-131**
   1. Manufacturer**:** Schlage 7766, or approved equal.

2.9 BUILDING SENSORS **(BY OTHERS)**

A. Temperature/Humidity Sensors: **Instruments: T-120, T-121, H-140, H-141**
   1. Manufacturer**:** Dwyer WHT-311, or approved equal.

B. Intrusion Sensors: **Instruments: XS-130. XS-131**
   1. Manufacturer**:** Schlage 7766, or approved equal.

2.12 SOURCE QUALITY CONTROL AND TESTS

A. Provide testing of instrument panels and panel mounted devices under provisions of Section 01 40 00

B. Provide shop inspection and testing of all instrument panel devices

C. Notify the Project Engineer two weeks prior to shipment of panel

D. Make corrections as identified by the Project Engineer prior to shipment

PART 3 **EXECUTION**

3.1 EXAMINATION

A. Verify all equipment in control loop or system is available and on-site prior to taking an existing loop out of service

B. Coordinate installation with existing equipment and control systems.

C. Review the requirements of the installation to ensure that the changeover can be performed within the project constraints

3.2 INSTALLATION

A. Products furnished “BY OWNER” shall be installed by Contractor. Contractor shall mount the PLC and pull all control wires from process equipment to the PLC.

B. Install all products per Manufacturer's recommendations and the Drawings.

C. Functional diagrams are intended to show the basic functional requirements of the control loops and systems and do not relieve the instrumentation supplier from the responsibility to provide a complete and functioning system

D. Provide signal converters and boosters as required

E. Panels:
   1. Install freestanding enclosures on 4 inch concrete housekeeping pads

2. Install level and plumb

F. Calibration of Instruments:
1. Notify the Project Engineer two weeks prior to calibrating instruments
2. The Project Engineer shall determine if calibration procedures will be witnessed
3. Perform calibration exactly as outlined in Manufacturer's printed instructions
4. Check calibration at several points along instrument range
5. Complete data entry on Instrument Calibration Record Sheet immediately after each step of calibration and obtain the Project Engineer's initials for each sheet
6. Completed Instrument Calibration Record Sheets and Instrument Loop Record Sheets must be submitted prior to substantial completion

G. Control Loop Checkout:
1. Perform control loop checkout in an organized fashion:
   a. Final elements should be first tested and verified
   b. Check loop from final element back to instrument cabinet, and/or control panel. Immediately record checkout data as it is verified on loop checkout sheet
   c. Verify loop operation at control cabinet or control panel
   d. The Contractor will demonstrate each working loop to the Project Engineer. The Project Engineer will confirm functional loops by initial on the loop checkout sheet

3.3 FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Section 01 79 00

B. Provide Manufacturer's field services for Work of this Section

C. Prior to start-up:
1. Advise Contractor on installation
2. Check, calibrate, and place equipment in operation
3. Visit the job as often as required and spend as much time as necessary to insure compliance with specification
4. Advise Contractor of necessary corrections for start-up

D. Start-up:
1. Check each loop and demonstrate operation to the Project Engineer
2. Complete Instrument Loop Record Sheets and obtain the Project Engineer’s initials on each sheet
3. Provide written directions to Contractor detailing all corrections necessary for proper operation
4. Provide 8 hours preliminary instruction to plant personnel on operation of instrumentation and controls after conclusion of loop checks

E. Follow-up and Training:
1. Check all corrections made since start-up and recalibrate instruments where changes have occurred

2. Inspect all instrument and control loops with plant personnel, address operation and performance concerns
3. Provide minimum of 8 hours of training encompassing all equipment described in this section

3.5 INSTRUMENT CALIBRATION RECORD

A. Attached

3.6 INSTRUMENT LOOP RECORD SHEET

A. Attached

END OF SECTION 25 30 00

INSTRUMENT CALIBRATION RECORD

CALIBRATION DATE: _____ CALIBRATOR: _____

INSTRUMENT TAG NO: _____ LOOP NAME: _____

CALIBRATED RANGE: _____ MANUFACTURER: _____

INPUT POWER SUPPLY: _____ MODEL NO: _____

UNITS: _____ VOLTSAC____ DC___

INPUT SIGNAL	EXPECTED DISPLAY	EXPECTED OUTPUT	ACTUAL DISPLAY	ACTUAL OUTPUT

REMARKS:

WITNESS/APPROVED:

_____ DATE: _____

_____ DATE: _____

RTW: _____ DATE: _____

INSTRUMENT LOOP RECORD SHEET

TEST DATE: _____ TESTED BY: _____

LOOP NAME: _____ MANUFACTURER: _____

LOOP NUMBER: _____ MODEL NO: _____

INPUT SIGNAL	REQUIRED SCALE	EXPECTED OUTPUT	AS CALIBRATED		
			INPUT	SCALE	OUTPUT

REMARKS:

WITNESS/APPROVED:

_____ DATE: _____

_____ DATE: _____

RTW: _____ DATE: _____

SECTION 25 51 00 – INTEGRATED AUTOMATION CONTROL OF FACILITY EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work of this section includes programming and control logic for new control systems and integration with existing. This work will be completed by the Town's controls consultant, *Control Systems Technology, Inc* (CST) of Idaho Falls. Contractor shall provide assistance and coordinate completion of this work with ToJ and CST.

B. Related Sections:
1. Section 01 79 00 – Demonstration and Training, provide training for operators.
2. Section 01 91 14 – Commissioning, functional performance testing of SCADA systems.
3. Section 25 30 00 – Instrumentation and Controls for Process Equipment
4. Division 26 00 00 - Electrical
5. Section 26 29 23 – Variable Frequency Controllers
6. Section 26 32 13 - Engine Generators
7. Section 33 23 13 – Public Water Supply Wells; Well 9 & Future Well 10
8. Division 40 00 00 – Process Integration
9. Section 40 05 23.72 – Miscellaneous Process Valves: Solenoid Valves
10. Section 43 21 13 – Centrifugal Liquid Pumps
11. Section 46 05 53 – Identification for Water and Wastewater Equipment
12. Section 46 31 11 – Chlorine Feed Equipment
13. Section 46 33 44 – Peristaltic Metering Pumps

1.2 SUBMITTALS

A. As specified in Section 01 33 23 "Submittal Procedures".

B. Provide a written request for clarification describing any additional control narrative information required from the Project Engineer.

C. Submit product information for software and equipment required to improve and integrate with existing water system controls and SCADA.

1.3 CLOSEOUT SUBMITTALS

A. As specified in Section 01 33 23 "Submittal Procedures".

B. Submit field startup and test reports in accordance with Sections 01 77 00 and 01 91 14.

C. Provide demonstration and training videos in accordance with Sections 01 79 00.

D. Submit record drawings of the process and instrumentation drawings (G.X)

E. Revise and submit final version of the control narrative provided in this specification. Engineer will provide this document in raw form for editing by SCADA provider.

F. Provide a record copy of the programming ladder logic following final acceptance of system

SCADA.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit a final copy of this control narrative. Engineer will provide a .doc copy of this section for editing by Contractor. Submit revised version in accordance with Section 01 78 23 “Operation and Maintenance Data”.

1.5 CONTROLS CONFERENCE

A. Convene one week prior to commencing programming.

B. Spend as much time as necessary to get a clear definition of the intent of the control narratives.

1.6 QUALIFICATIONS

A. Acceptable SCADA System Installer and Programmer:
1. Current SCADA systems are maintained and programmed by *Control Systems Technology, Inc* (CST), Idaho Falls, ID. Provided the complexities of integrating new equipment with existing systems, it is required by Owner that Contractor sub-consult with CST for controls work. Contract information for CST is provided below.

Mike Wareing
Control System Technology, Inc.
5471 Heyrend Dr.
Idaho Falls, ID 83402
(208) 523-2796
mwareing@controlsys.com

PART 2 - PRODUCTS

A. All equipment and software shall be non-proprietary, serviceable and maintainable by any qualified controls contractor.

B. SCADA equipment and software shall be compatible with existing systems, same or similar make (manufacturer) as existing equipment, and the latest in technology. Installation of outdated equipment will not be allowed.

C. Provide all necessary material, equipment and software to interface new equipment with existing.

D. Equipment as specified in Division 26 and Section 25 30 00 – Instrumentation and Control for Process Systems.

PART 3 - EXECUTION

3.1 GENERAL

A. New controls logic should be based on existing logic for similar existing equipment operated by Owner. Controls contractor should utilize the running logic for the Ely Springs Well House as a starting point to develop new control logic for the ToJ HSR PUMP HOUSE.

B. Work described in this Section includes integration of new equipment associated with the High School Road (HSR) Well House, Well 9, Well 10 and future Well 11 operations. The new system shall interface with existing ToJ SCADA systems, allowing for remote accessibility. Contractor shall notify Engineer in the event that operation and display of equipment and process trends, status, alarms and setpoints described herein differs from what exists for similar operations and equipment. For this case, and in most instances, current SCADA operations and processes will prevail.

D. Warranty: Contractor shall warrant all SCADA work for a period of 1 (one) year starting from the date of substantial completion. Within the warranty period, all costs associated with labor, equipment, hardware, software, travel and ancillary materials required to repair or modify the SCADA system to ensure intended functionality and compliance with contract requirements shall be borne by Contractor.

3.2 OPERATION

A. The control logic described under this section is organized to follow the P&ID drawings. Not all functions are indicated in both the P&ID drawings and the control narrative. Control logic programming shall be integrated with the existing ToJ SCADA system, as well as, the specific process and control equipment for this project. It is the responsibility of the programmer to become familiar with existing systems and verify compatibility of new and existing equipment and software. The furnishment and installation of necessary equipment, hardware and software to ensure compatibility and functionality of the SCADA system is the sole responsibility of Contractor; no additional compensation by Owner will be made for fulfilling requirements of this Section.

B. Motor controllers:
   1. All motor controllers shall be provided with running time meters, running pilot light, and off pilot light.
   2. Contractor shall assume motorized equipment not paired with a variable frequency drive (VFD) have soft-starters.
   3. Equipment intended to run at variable speed shall be programmed to operate within the equipment manufacturer approved operating ranges. Programmer shall consult with Engineer and manufacturer to establish operating ranges.

C. Control switches:
   1. Equipment with Hand-Off-Auto (HOA) control:
      a. In the HAND position, the controlled equipment will run without programming influence from the PLC or SCADA system.
      b. In the OFF position, the controlled equipment will not run
      c. In the AUTO position, the controlled equipment will operate as described in the applicable narrative(s) and as indicated in the process and instrumentation (PID) drawings

E. General:
   1. The Operator Interface (OI), or main control center of well operations, is located at the PLC. The HMI at the OI shall provide depictions (digital schematics) of process equipment and conveyance systems, as well as equipment status, setpoints and alarms. Display the following at the OI:
      a. Display all alarms and equipment status (off/run/failure)
      b. Display equipment speed (Hz)

c. Provide operator adjustable setpoints for alarms and controls
d. Display system variables (flow rates, levels, etc.)
e. Provide a common alarm to a visual/audible alarm device via. a common PLC output

2. Provide PLC failure output alarm to a dedicated front panel indicating light as well as to the common visual/audible alarm device
3. Display units of measurement for all analyzers and sensors at each HMI.
4. Generate "Not running" alarms for all equipment required to run, but which are not running within 15 seconds of being called to run.
5. Provide operator interface to all PID control loops for adjustment and tuning
6. Provide all VFDs with integral disconnect switch.
7. Install and make all necessary wiring, equipment and programming changes at existing local control panels (LCP), and program logic controllers (PLC) noted in this Section for integration with existing equipment.
8. All control panels shall provide spare I/O capacity/space in excess of 15% of what is required and planned in the future (Well 11 equipment), but not less than 8 additional I/O terminals. Consult with Engineer in the event existing panel space is inadequate to provide spare terminals for future controls.
9. Deviations from requirements in the Schedules subsection below shall be coordinated with the Engineer prior to execution.
10. In Auto position, if a well or associated chlorine disinfection or iron/manganese treatment equipment fails to run, then neither shall be allowed to run. Operation control will prevent non-treated water from reaching distribution and/or high chemical treatment of the wellhead or pipeline.

3.3 SCHEDULES

A. Tag Series: **G-110**

1. Area: Standby/backup diesel generator located in a separate room in the Well House.

2. Equipment & Devices:
   a. Generator and Transfer Switch (Section 26 32 13): **ATS-110**
   b. Fuel Level Sensor (Section 26 32 13): **LS-110**
   c. Remote Fueling Station (Section 26 32 13): **FS-110**

3. Narrative
   a. A 500 KW diesel generator will be provided for backup power during utility power outage. An automatic transfer switch will initiate upon power outage, and start the generator to power public water supply infrastructure at the HSR PUMP HOUSE. The Generator shall have a vendor supplied local control panel. The local control panel shall have the following indicators, alarms and controls as listed below for PLC-100.
      1) Provide the following status indications at the PLC-100 HMI via. programming as it pertains operation of the generator and transfer switch (**ATS-110**):
         a) Utility Power Failure
         b) Generator Running Status
         c) Display auto transfer switch status (normal-emergency)
         d) Display generator common alarm
      2) Provide the following status indications at the PLC-100 HMI via. programming as it pertains operation of the fuel level sensor located in the diesel storage tank (**LS-110**):

a) Instantaneous fuel level; % of full tank
b) Low Fuel Alarm
c) Level Sensor Failure

4. SCADA – HMI at the Public Works Office
   a. Generator and Transfer Switch: **G-110**
      1) Utility Power Failure
      2) Running Status
      3) Generator Failure Alarm
   b. Fuel Level Sensor: **LS-110**
      1) Instantaneous Fuel Level; % of full tank
      2) Low Fuel Alarm
      3) Level Sensor Failure

B. Tag Series: **120**
   1. Area: Chlorine and Control Rooms in the Well House.

   2. Equipment & Devices:
      a. Temperature Sensor (Section 25 30 00): **T-120**
      b. Temperature Sensor (Section 25 30 00): **T-121**

   3. Narrative
      a. Place digital thermometers within the control and chlorine rooms in the HSR PUMP HOUSE. The sensors will monitor temperature within the space and display instantaneous readings at the HMI. Initiate low and high room temperature alarms when room temperatures are below 40 deg. F and above 95 deg. F,respectively.
         1) Provide the following status indications and setpoints at the PLC-100 HMI via. programming for both the control and chlorine rooms.
            a) Instantaneous Room Temperatures (2 ea.)
            b) Low Temperature Setpoints (2 ea.)
            c) High Temperature Setpoints (2 ea.)
            d) Low/High Room Temperature Alarms (2 ea.)
            e) Temperature Sensor Failure (2 ea.)
   4. SCADA – HMI at the Public Works Office
      a. Temperature Sensor: **T-120 & T121**
         1) Low/High Room Temperature Alarms (2 ea.)
         2) Temperature Sensor Failure (2 ea.)

C. Tag Series: **130**
   1. Area: Chlorine and Control Room entry doors.

   2. Equipment & Devices:
      a. Intrusion Sensor (Section 25 30 00): **XS-130**
      b. Intrusion Sensor (Section 25 30 00): **XS-131**

   3. Narrative
      a. Place magnetic door intrusion sensors for security at each man door to the HSR PUMP HOUSE to provide indication of unauthorized entry.
      b. Upon Operator entry to each facility and prior to alarm dial out, the PLC at the Well House shall beep for two (2) minutes indicating “personnel entry”. Provide alarm acknowledgement at the PLC via coded entry key pad at the PLC;

Operator set password shall be a minimum of four (4) characters. If the alarm has not been acknowledged within two (2) minutes, the PLC shall initiate the alarm dialer for indication of "unauthorized entry".

1) Provide the following status indications and setpoints at the PLC-100 HMI via. programming for both the control and chlorine rooms.
   a) Building Intrusion Alarm

4. SCADA – HMI at the Public Works Office
   a. Temperature Sensor: **XS-130 & XS-131**
      1) Building Intrusion Alarm
      2) Building Intrusion Sensor Failure

D. Tag Series: **140**

1. Area: Chlorine and Control Rooms in the Well House.

2. Equipment & Devices:
   a. Humidity Sensor (Section 25 30 00): **H-140**
   b. Humidity Sensor (Section 25 30 00): **H-141**

3. Narrative
   a. Place digital humidity sensors within the control and chlorine rooms in the HSR PUMP HOUSE. The sensors will monitor humidity within each room and display instantaneous readings at the HMI. Initiate high room humidity alarm when humidity exceeds 40% (initial setpoint).
      1) Provide the following status indications and setpoints at the PLC-100 HMI via. programming for both the control and chlorine rooms.
         a) Instantaneous Room Humidity
         b) High Humidity Setpoint
         c) High Humidity Alarms
         d) Humidity Sensor Failure

4. SCADA – HMI at the Public Works Office
   a. Humidity Sensor: **H-140 & H-141**
      1) High Room Humidity Alarms
      2) Humidity Sensor Failure

E. Tag Series: **010, 900, 920,**

1. Area: Well 9 located north of the Well House approximately 1400-ft northwest in Rangeview Park.

2. Equipment & Devices:
   a. Well 9 Pump (Sections 33 21 13): **W-900**
   b. Well Variable Frequency Drive/Controller (Sections 26 29 23): **LCP/VFD-910**
   c. Submersible Pressure Transducer (Section 25 30 00): **PT-912**
   d. Magnetic Flow Meter (Section 25 30 00): **FM-921**
   e. Water Transition Manifold Pressure Sensor/Transmitter (Section 25 30 00): **PT-011 & 012**

3. Narrative
   a. Well Pump (**W-900**), located in within the well casing of Well 9.

1) Provide pump with a local lockout disconnect near the wellhead.

2) Provide status indicators and setpoints at LCP/VFD-910. Well pump and control equipment settings and status indicators shall be transmitted from LCP-910 (pump/motor VFD – see Section 26 29 23) to PLC 100/RTU and broadcast via radio transmission to the Town's SCADA system. Provide the following statuses and control setpoints for operation of the well at LCP/VFD-910. Preliminary estimated setpoints are provided below for reference.

   a) HOA Position
   b) Minimum Speed Setpoint – 46.5 Hz
   c) Discharge Pressure Setpoint – 95 psi (PT-011/012)
   d) Low Pressure Startup Setpoint – 85 psi (PT-011)
   e) High Pressure Shutdown Setpoint – 98 psi (PT-011)
   f) Low/High Pressure Alarm (PT-011/012)
   g) Low Water Level Alarm Setpoint – 5-ft (PT-912)
   h) Run status light
   i) Fail status light (therm. overload)
   j) Hour Meter (hours of operation)
   k) Reset button

3) Provide Lead/Lag selection at the PLC 100/RTU and provide status to Town's SCADA system.

   a) Lead/Lag Selection: Well 9 will provide water supply to the same water system pressure zone (Zone 3) as the Ely Springs Wells 6, 7 and 8. CST shall provide a means for operators to access status and controls of Ely Springs Well House via. SCADA at the new HSR PUMP HOUSE and vise versa. Well/Pump operating status (lead/lag1/lag2/lag3/lag4, etc.) for Well 9, 10 and future Well 11 as it relates to the Ely Springs wells, as well as setpoints described below, will dictate when the well operates.

4) In "Auto" position, the pump shall automatically operate via. controls at the PLC-100/HMI and shut down in a fault condition.

   a) Minimum Speed Setpoint: Provide an operator minimum speed setpoint that only allows a range input between the pump manufacturer's recommended minimum speed and maximum speed (60 Hz). Preliminary minimum speed setting based on preferred pump (Franklin 150HP, 9" STS) is 46.5 Hz, equivalent to 630 gpm at 85 psi discharge pressure.
   b) Discharge Pressure setpoint: Well 9 shall be programmed to operate based on header pressure (PT-011/012) via. speed control at the VFD and the discharge setpoint established by the operator. If PT-011 is in a failed state the pressures read by PT-012 shall control operations via. the PLC.
   c) Low Pressure Startup setpoint: An operator low pressure setpoint shall initiate well operation when pressure readings fall below the setpoint for more than 30 seconds. . The delay should cause the well in "lag" to ramp quickly to the minimum speed setpoint (46.5 Hz) and slowly ramp thereafter to maintain the discharge pressure setpoint.
   d) High Pressure Shutdown setpoint: When pressure (PT-011 or PT-012) reaches the setpoint, the operating system shall be programmed

to shut down the well.

e) Low/High Pressure Alarm: When pressure falls below the low pressure setpoint, or above the high pressure setpoint for more than 30 seconds, the system shall alarm to SCADA. If the system high pressure alarm initiates, the operating system shall automatically shutdown a well until the condition is resolved.

f) Low Water Level Alarm Setpoint: If water level in the well casing (PT-912) falls below the low water level alarm setpoint, the well pump speed should slow to maintain water levels above the low water level setpoint; i.e. this operation should override operation of the well to maintain the discharge pressure setpoint. The well should be programmed to shutdown if the well is operating at the minimum speed setpoint and the water level remains below the alarm setpoint.

b. Pressure Sensor/Transmitter (**PT-011 & PT-012**) located in the Well House at the well supply manifold.

1) Program the following pressure statuses at the PLC-100 HMI.

a) Provide instantaneous pressure readings in pound per square inch (psi)

b) Provide pressure trends for the past 90 days

c) Sensor Failure Alarm

c. Submersible Pressure Transducer (**PT-912**), located in the well casing of Well 9.

1) Provide the following pressure statuses at the PLC-100 HMI:

a) Provide instantaneous level readings in feet

b) Provide average daily level readings. Store daily values at the PLC for a period of 3-years for download.

c) Provide pressure trends for the past 90 days.

d) Sensor Failure Alarm

d. Magnetic Flow Meter (**FM-921**) located in the Well House at the well supply manifold for monitoring water production from Well 9.

1) Provide the following flow statuses at the PLC-100 HMI via. programming:

a) Provide instantaneous meter readings in gallons per minute (gpm)

b) Provide daily volumetric water pumped in gallons per day (gpd). Store daily values at the PLC for a period of 3-years for download.

c) Provide monthly flows for the current and past 2 months starting at the first of each month.

d) Provide pressure trends for the past 90 days.

e) Sensor Failure Alarm

4. SCADA – HMI at the Public Works Office

a. Well 9 Pump: **W-900**

1) Hand-Off-Auto Status

2) Lead/Lag Status

3) Run Status

4) Pump Failure Alarm

5) Alarm Status

b. Pressure Sensor/Transmitter: **PT-911**

1) Instantaneous Discharge Pressure

2) Access to 90-day pressure trend

3) Sensor Failure Alarm

c. Submersible Pressure Transducer: **PT-912**
   1) Instantaneous Water Level in Well
   2) Access to 90-day water level trend.
   3) Sensor Failure Alarm

d. Magnetic Flow Meter: **FM-921**
   1) Instantaneous Flows for Well 9
   2) Access to 90-day flow trend
   3) Sensor Failure Alarm

F. Tag Series: **930**

1. Area: Orthophosphate (phosphate) feed system to treat for iron and manganese in Well 9 located within the control room of the Well House.

2. Equipment & Devices:
   a. Peristaltic Pump (Section 46 33 44): **P-931**
   b. Vertical Turbine Booster Pump (Section 43 21 13): **P-933**
   c. Pressure Transmitter (Section 43 21 13): **PT-933**
   d. Solenoid Valve (Section 40 05 23.72): **SV-932**

3. Narrative
   a. Phosphate feed system peristaltic pump (**P-931**) shall feed chemical from the storage tank and inject it into a boosted pressure return line (125 psi+/-) containing conditioned water, with final delivery (injection) to the Well 9 supply pipeline at the chemical injection vault located approximately 600-ft northwest of the Well House. The booster pump (**P-933**), located in the Well House Control Room, comprises and integral pump, motor and VFD in the same unit. Upon Well 9 startup, solenoid valve (**SV-932**) shall open, followed by startup of the booster pump (**P-933**), and lastly startup of the metering pump (**P-931**). The booster pump (**P-933**) shall automatically vary speed to maintain downstream pressure indicated by a pressure transmitter (**PT-933**). The meter pump (**P-931**) shall automatically operate at variable rates based on Well 9 flows (**FM-921**). The feed rate for the metering pump (**P-931**) is adjustable based on 4-20mA input from 0 to 12 gpd. The Engineer, in coordination with the Town officials, will provide an equation similar to the chlorine smart valve operation, identifying the preferred injection rate (gpd) based on well flow (**FM-921**) and water chemistry. For reference, the feed rate for the Ely Springs wells is roughly 0.6 gpd for every 100 gpm pumped by the well(s).
      1) Provide the following status at the PLC-100 HMI via. programming as it pertains to operation of the solenoid valve (**SV-932**):
         a) Open/Close Status
         b) Valve Failure Status
      2) Provide the following status at the PLC-100 HMI via. programming as it pertains to operation of the pressure transmitter (**PT-933**):
         a) Instantaneous Pressure
         b) Fail Status
      3) Provide the following status at the PLC-100 HMI via. programming as it pertains to operation of the booster pump (**P-933**):
         a) Run Status
         b) Pump Speed

c) Discharge Pressure Setpoint (120 psi)
d) Hour Meter
e) Fail Status
f) Reset Button

4) Provide the following feed rate statuses and setpoints at the PLC-100 HMI via. programming as it pertains operation of the peristaltic pump (**P-931**):
a) Feed Rate Setpoint (gpd)
b) Provide instantaneous feed rates in gallons per day (gpd)
c) Provide feed rate trends for the past 90 days.
d) Pump Failure Alarm

4. SCADA – HMI at the Public Works Office
a. Solenoid Valve: **SV-932**
1) Open/Close Status
2) Valve Failure Alarm
b. Pressure Transmitter: **PT-933**
1) Instantaneous Pressure
2) Fail Status
c. Booster Pump: **P-933**
1) Run Status
2) Failure Alarm
d. Peristaltic Pump: **P-931**
1) Instantaneous Feed Rate
2) Access to 90-day Feed Rate Trend
3) Pump Failure Alarm

G. Tag Series: **060, 069, 950, 960**
1. Area: Chlorine Gas system to disinfect raw water from Well 9 located in the Well House Chlorine Room. Chlorine analyzer (sensor) located on the supply manifold in the electrical and control room of the well house.

2. Equipment & Devices:
a. Solenoid Valve (Section 40 05 23.72): **SV-955**
b. Vertical Turbine Booster Pump (Section 43 21 13): **P-953**
c. Pressure Transducer (Section 43 21 13): **PT-953**
d. Chlorine Feed Smart Valve (Section 46 31 11): **CHL-952**
e. Cylinder Scale (Section 46 31 11): **CHL-060**
f. Chlorine Gas Leak Detector (Section 46 31 11): **CHL-065**
g. Chlorine Analyzer: (Section 25 30 00): **CLA-069**

3. Narrative
a. Solenoid Valve (**SV-955**) is located in the chlorine disinfection room w/in the Well House. In the open position, water flows through the solenoid valve and to the chlorine gas injector creating a vacuum and pulling chlorine gas from the feed system (**CHL-952**) into the return line. Upon startup of Well 9, the solenoid valve should open, and the booster pump (**P-953**) shall startup to provide return conditioned water supply at boosted pressure (195 psi+/-) to the chlorine injector. Immediately thereafter, the chlorine feed smart valve (**CHL-952**) shall initiate operation based on the narrative in item "b" below. Concentrated chlorinated

water is delivered from the injector site to the chemical injection vault located approximately 600-ft northwest of the Well House.

b. Chlorine Feed Smart Valve (**CHL-952**) is located in the chlorine disinfection room w/in the Well House. The smart valve shall adjust chlorine gas feed rate based on well flow rate (**FM-921**) by receiving a flow proportional (variable) 4-20mA output from PLC-100, or well flow meter. The smart valve shall be programmed so that feed rate in pound-per-day (ppd) will vary linearly between minimum and maximum flow rates of the well. The PLC shall calculate the chlorine feed rate (ppd) based on an operator setpoint for desired chlorine concentration in potable water supply and instantaneous well flow (**FM-921**) per the equation below.

Chl. Feed Rate = F*([Chl.] Supply)*(Well Flow) where,

Chl. Feed Rate	=	Smart Valve Feed Rate (ppd)
F	=	Conversion Factor, or 0.012
[Chl.] Supply	=	Desired Chlorine Concentration in Potable Water Supply (ppm)
Well Flow	=	Instantaneous Flow Rate of Operating Well (gpm), FM-921

In automatic control, the PLC shall calculate and provide 4-20mA analog output signal to the smart valve in order to adjust chlorine gas feed rate at a minimum of every 5-seconds. For instance, if the operator sets the desired chlorine concentration for potable water to 0.6 ppm and the well is operating at 1000 gpm, the calculated feed ratefor the smart valve should be 7.2 ppd based on the equation above. The maximum feed rate for the Smart Valve is 50 ppd, thus analog output is 4mA for 0 ppd, and 20mA for 50 ppd. Based on a linear relationship, the calculated analog output to the smart valve (**CHL-952)** should be 6.30 mA (0.32 mA/ppd*7.2 ppd+ 4mA).

1) Provide the following status at the PLC-100 HMI via. programming as it pertains to operation of the solenoid valve (**SV-955**):
   a) Open/Close Status
   b) Valve Failure Status

2) Provide the following status at the PLC-100 HMI via. programming as it pertains to operation of the pressure transmitter (**PT-953**):
   a) Instantaneous Pressure
   b) Fail Status

3) Provide the following status at the PLC-100 HMI via. programming as it pertains to operation of the booster pump (**P-953**):
   a) Run Status
   b) Pump Speed
   c) Discharge Pressure Setpoint (195 psi)
   d) Hour Meter
   e) Fail Status
   f) Reset Button

4) Provide the following feed rate statuses and setpoints from the smart valve (**CHL-952)** at the PLC-100 HMI via. programming:
   a) Chlorine Concentration Setpoint (0.6 mg/L - typ. potable water)
   b) Provide instantaneous feed rate in pounds per day (ppd)
   c) Provide feed rate trends for the past 90 days.
   d) Smart Valve Failure Alarm

c. Chlorine Cylinder Scale (**CHL-060**) located in the chlorine disinfection room w/in the Well House. Provide all required devices by chlorine system mfg for automatic switchover between empty and full 150-lb chlorine gas cylinders.
   1) Provide the following statuses and setpoints at the PLC-100 HMI via. programming:
      a) Low Chlorine Alarm Setpoint (lbs)
      b) Cylinder weights (2 ea. in lbs) shall be displayed locally and information transmitted via. 4-20mA output to PLC-100.
      c) Scale Failure Alarm

d. Chlorine Gas Leak Detector (**CHL-065**) located in the chlorine disinfection room w/in the Well House.
   1) Provide the following statuses and setpoints at the PLC-100 HMI via. programming:
      a) Chlorine Gas Warning Alarm (>1 ppm Cl_2)
      b) Danger Alarm (>3 ppm Cl_2)
      c) Detector Failure Alarm

e. Chlorine Analyzers **CLA-069**: Provide residual readout of chlorine concentration (0 to 20 ppm) at PLC-100 every 60 seconds via. **LCP-069**,
   1) Provide the following statuses and setpoints at the PLC-100 HMI via. programming:
      a) Residual Chlorine (0 to 20 ppm Cl_2)
      b) Low Residual Chlorine Alarm Setpoint (<0.5 ppm Cl_2)
      c) High Residual Chlorine Alarm Setpoint (>1 ppm Cl_2)

4. SCADA – HMI at the Public Works Office
   a. Solenoid Valve: **SV-955**
      1) Open/Close Status
      2) Valve Failure Alarm
   b. Pressure Transmitter: **PT-953**
      1) Instantaneous Pressure
      2) Fail Status
   c. Booster Pump: **P-953**
      1) Run Status
      2) Failure Alarm
   d. Chlorine Feed Smart Valve: **CHL-952**
      1) Chlorine Concentration Setpoint
      2) Instantaneous Chlorine Feed Rate (ppd)
      3) Access to 90-day Feed Rate Trend
      4) Smart Valve Failure Alarm
   e. Chlorine Cylinder Scale: **CHL-060**
      1) Display Cylinder Weight (lbs)
      2) Low Chlorine/Cylinder Alarm

3) Scale Failure Alarm

f. Chlorine Gas Leak Detector: **CHL-065**
   a) Chlorine Gas Warning Alarm
   b) Danger Alarm
   c) Detector Failure Alarm

g. Chlorine Analyzer: **CLA-069**
   a) Residual Chlorine Concentration
   b) Low Residual Chlorine Alarm Setpoint
   c) High Residual Chlorine Alarm Setpoint
   d) Sensor Failure Alarm

H. Tag Series: **1000, 1020, 011 – 012**

1. Area: Well 10 located 20-ft west and exterior to the Well House

2. Equipment & Devices:
   a. Well 10 Pump (Sections 33 21 13): **W-1000**
   b. Well Variable Frequency Drive/Controller (Sections 26 29 23): **LCP/VFD-1010**
   c. Submersible Pressure Transducer (Section 25 30 00): **PT-1012**
   d. Magnetic Flow Meter (Section 25 30 00): **FM-1021**
   e. Water Transition Manifold Pressure Sensor/Transmitter: See item "E" above, common equipment for all wells.

3. Narrative
   a. Well Pump (**W-1000**), located in within the well casing of Well 10 west of the well house building
      1) Provide pump with a local lockout disconnect near the wellhead.
      2) Provide status indicators and setpoints at LCP/VFD-1010. Well pump and control equipment settings and status indicators shall be transmitted from LCP-1010 (pump/motor VFD – see Section 26 29 23) to PLC 100/RTU and broadcast via radio transmission to the Town's SCADA system. Provide the following statuses and control setpoints for operation of the well at LCP/VFD-1010. Preliminary estimated setpoints are provided below for reference.
         a) HOA Position
         b) Minimum Speed Setpoint – 46.5 Hz
         c) Discharge Pressure Setpoint – 95 psi (PT-1011)
         d) Low Pressure Startup Setpoint – 85 psi (PT-011/012)
         e) High Pressure Shutdown Setpoint – 98 psi (PT-011)
         f) Low/High Pressure Alarm (PT-011/012)
         g) Low Water Level Alarm Setpoint – 5-ft (PT-1012)
         h) Run status light
         i) Fail status light (therm. overload)
         j) Hour Meter (hours of operation)
         k) Reset button
      3) Provide Lead/Lag selection at the PLC 100/RTU and provide status to Town's SCADA system.
         a) Lead/Lag Selection: Well 10 will provide water supply to the same water system pressure zone (Zone 3) as the Ely Springs Wells 6, 7 and 8. CST shall provide a means for operators to access status and

controls of Ely Springs Well House via. SCADA at the new HSR PUMP HOUSE and vise versa. Well/Pump operating status (lead/lag1/lag2/lag3/lag4, etc.) for Well 9, 10 and future Well 11 as it relates to the Ely Springs wells, as well as setpoints described below, will dictate when the well operates.

4) In "Auto" position, the pump shall automatically operate via. controls at the PLC-100/HMI and shut down in a fault condition.

a) Lead/Lag Selection: Well 10 will provide water supply to the same water system pressure zone (Zone 3) as the Ely Springs Wells 6, 7 and 8. CST shall provide a means for operators to access status and controls of Ely Springs Well House via. SCADA at the new HSR PUMP HOUSE and vise versa. Well/Pump operating status (lead/lag1/lag2/lag3/lag4, etc.) for Well 10 as it relates to the Ely Springs wells, as well as setpoints described below, will dictate when the well operates.

b) Minimum Speed Setpoint: Provide an operator minimum speed setpoint that only allows a range input between the pump manufacturer's recommended minimum speed and maximum speed (60 Hz). Preliminary minimum speed setting based on preferred pump (Franklin 150HP, 9" STS) is 46.5 Hz, equivalent to 630 gpm at 85 psi discharge pressure.

c) Discharge Pressure setpoint: Well 10 shall be programmed to operate based on header pressure (PT-011) via. speed control at the VFD and the discharge setpoint established by the operator. If PT-011 is in a failed state the pressures read by PT-012 shall control operations via. the PLC.

d) Low Pressure Startup setpoint: An operator low pressure setpoint shall initiate well operation when pressure readings fall below the setpoint for more than 30 seconds. The delay should cause the well in "lag" to ramp quickly to the minimum speed setpoint (46.5 Hz) and slowly ramp thereafter to maintain the discharge pressure setpoint.

e) High Pressure Shutdown setpoint: When pressure (PT-011 or PT-12) reaches the setpoint, the operating system shall be programmed to shut down the well.

f) Low/High Pressure Alarm: When pressure falls below the low pressure setpoint, or above the high pressure setpoint for more than 30 seconds, the system shall alarm to SCADA. If the system high pressure alarm initiates, the operating system shall automatically shutdown a well until the condition is resolved.

g) Low Water Level Alarm Setpoint: If water level in the well casing (PT-1012) falls below the low water level alarm setpoint, the well pump speed should slow to maintain water levels above the low water level setpoint; i.e. this operation should override operation of the well to maintain the discharge pressure setpoint. The well should be programmed to shutdown if the well is operating at the minimum speed setpoint and the water level remains below the alarm setpoint.

b. Pressure Sensor/Transmitter (**PT-011 & PT-012**) located in the Well House at the well supply manifold. Common equipment, comply with requirements under "G" above for Well 9.

c. Submersible Pressure Transducer (**PT-1012**), located in the well casing of Well 10.
   1) Provide the following pressure statuses at the PLC-100 HMI via. programming:
      a) Provide instantaneous level readings in feet
      b) Provide average daily level readings. Store daily values at the PLC for a period of 3-years for download.
      c) Provide pressure trends for the past 90 days.
      d) Sensor Failure Alarm

d. Magnetic Flow Meter (**FM-1021**) located in the Well House at the well supply manifold for monitoring water production from Well 10.
   1) Provide the following flow statuses at the PLC-100 HMI:
      a) Provide instantaneous meter readings in gallons per minute (gpm)
      b) Provide daily volumetric water pumped in gallons per day (gpd). Store daily values at the PLC for a period of 3-years for download.
      c) Provide monthly flows for the current and past 2 months starting at the first of each month.
      d) Provide pressure trends for the past 90 days.
      e) Sensor Failure Alarm

4. SCADA – HMI at the Public Works Office
   a. Well 10 Pump: **W-1000**
      1) Hand-Off-Auto Status
      2) Lead/Lag Status
      3) Run Status
      4) Pump Failure Alarm
      5) Alarm Status
   b. Pressure Sensor/Transmitter: **PT-1011**
      1) Instantaneous Discharge Pressure
      2) Access to 90-day pressure trend
      3) Sensor Failure Alarm
   c. Submersible Pressure Transducer: **PT-1012**
      1) Instantaneous Water Level in Well
      2) Access to 90-day water level trend.
      3) Sensor Failure Alarm

   d. Magnetic Flow Meter: **FM-1021**
      1) Instantaneous Flows for Well 10
      2) Access to 90-day flow trend
      3) Sensor Failure Alarm

I. Tag Series: **1030**
   1. Area: Orthophosphate (phosphate) feed system to treat for iron and manganese in Well 10 located within the control room of the Well House.

   2. Equipment & Devices:
      a. Peristaltic Pump (Section 46 33 44): **P-1031**
      b. Solenoid Valve (Section 40 05 23.72): **SV-1032**

   3. Narrative

a. Phosphate feed system peristaltic pump (**P-1031**) shall feed chemical from the storage tank and inject it into a conditioned water return line (98 psi+/-) with final delivery (injection) to the Well 10 wellhead at the pump (W-1000) intake screen. Upon Well 10 startup, solenoid valve (**SV-1032**) shall open, followed by startup of the metering pump (**P-1031**). The meter pump (**P-1031**) shall automatically operate at variable rates based on Well 10 flows (**FM-1021**). The feed rate for the metering pump (**P-1031**) is adjustable based on 4-20mA input from 0 to 12 gpd. The Engineer, in coordination with the Town officials, will provide an equation similar to the chlorine smart valve operation, identifying the preferred injection rate (gpd) based on well flow (**FM-1021**) and water chemistry. For reference, the feed rate for the Ely Springs wells is roughly 0.6 gpd for every 100 gpm pumped by the well(s).

1) Provide the following status at the PLC-100 HMI via. programming as it pertains to operation of the solenoid valve (**SV-1032**):
   a) Open/Close Status
   b) Valve Failure Status
2) Provide the following feed rate statuses and setpoints at the PLC-100 HMI via. programming as it pertains operation of the peristaltic pump (**P-1031**):
   a) Feed Rate Setpoint (gpd)
   b) Provide instantaneous feed rates in gallons per day (gpd)
   c) Provide feed rate trends for the past 90 days.
   d) Pump Failure Alarm

4. SCADA – HMI at the Public Works Office
   a. Solenoid Valve: **SV-1032**
      1) Open/Close Status
      2) Valve Failure Alarm
   b. Pressure Transmitter: **PT-1033**
      1) Instantaneous Pressure
      2) Fail Status
   c. Booster Pump: **P-1033**
      1) Run Status
      2) Failure Alarm
   d. Peristaltic Pump: **P-1031**
      1) Instantaneous Feed Rate
      2) Access to 90-day Feed Rate Trend
      3) Pump Failure Alarm

J. Tag Series: **060, 069, 1050, 1060**

1. Area: Area: Chlorine Gas system to disinfect raw water from Well 10 located in the Well House Chlorine Room. Chlorine analyzer (sensor) located on the supply manifold in the electrical and control room of the well house.

2. Equipment & Devices:
   a. Solenoid Valve (Section 40 05 23.72): **SV-1055**
   b. Chlorine Feed Smart Valve (Section 46 31 11): **CHL-1052**
   c. Cylinder Scale: See item “G” above, common equipment for all well disinfection systems.
   d. Chlorine Gas Leak Detector: See item “G” above, common equipment for all well disinfection systems.

e. Chlorine Analyzer: (Section 25 30 00): **CLA-069**

3. Narrative

a. Solenoid Valve (**SV-1055**) is located in the chlorine disinfection room w/in the Well House. In the open position, water flows through the solenoid valve and to the chlorine gas injector creating a vacuum and pulling chlorine gas from the feed system (**CHL-1052**) into the return line. Upon startup of Well 10, the solenoid valve should open providing conditioned water at system pressure (98 psi+/-) to the chlorine injector. Immediately thereafter, the chlorine feed smart valve (**CHL-1052**) shall initiate operation based on the narrative in item "b" below. Concentrated chlorinated water is delivered from the injector site to the Well 10 wellhead at the pump (W-1000) intake screen.

b. Chlorine Feed Smart Valve (**CHL-1052**) is located in the chlorine disinfection room w/in the Well House. The smart valve shall adjust chlorine gas feed rate based on well flow rate (**FM-1021**) by receiving a flow proportional (variable) 4-20mA output from PLC-100, or well flow meter. The smart valve shall be programmed so that feed rate in pound-per-day (ppd) will vary linearly between minimum and maximum flow rates of the well. The PLC shall calculate the chlorine feed rate (ppd) based on an operator setpoint for desired chlorine concentration in potable water supply and instantaneous well flow (**FM-1021**) per the equation below.

Chl. Feed Rate = F*([Chl.] Supply)*(Well Flow) where,

Chl. Feed Rate	=	Smart Valve Feed Rate (ppd)
F	=	Conversion Factor, or 0.012
[Chl.] Supply	=	Desired Chlorine Concentration in Potable Water Supply (ppm)
Well Flow	=	Instantaneous Flow Rate of Operating Well (gpm), FM-1021

In automatic control, the PLC shall calculate and provide 4-20mA analog output signal to the smart valve in order to adjust chlorine gas feed rate at a minimum of every 5-seconds

For instance, if the operator sets the desired chlorine concentration for potable water to 0.6 ppm and the well is operating at 1000 gpm, the calculated feed rate for the smart valve should be 7.2 ppd based on the equation above. The maximum feed rate for the Smart Valve is 50 ppd, thus analog output is 4mA for 0 ppd, and 20mA for 50 ppd. Based on a linear relationship, the calculated analog output to the smart valve (**CHL-1052)** should be 6.30 mA (0.32 mA/ppd*7.2 ppd + 4mA).

1) Provide the following status at the PLC-100 HMI via. programming as it pertains to operation of the solenoid valve (**SV-1055**):
   a) Open/Close Status
   b) Valve Failure Status

2) Provide the following feed rate statuses and setpoints from the smart

valve (**CHL-1052)** at the PLC-100 HMI via. programming:

a) Chlorine Concentration Setpoint (0.6 mg/L - typ. potable water)
b) Provide instantaneous feed rate in pounds per day (ppd)
c) Provide feed rate trends for the past 90 days.
d) Smart Valve Failure Alarm

c. Chlorine Cylinder Scale (**CHL-060**): Common equipment, comply with requirements under "G" above for Well 9.

d. Chlorine Gas Leak Detector (**CHL-065**): Common equipment, comply with requirements under "G" above for Well 9.

e. Chlorine Analyzer **CLA-069**: Provide residual readout of chlorine concentration (0 to 20 ppm) at PLC-100 every 60 seconds via. **LCP-069**.

1) Provide the following statuses and setpoints at the PLC-100 HMI via. programming:

a) Residual Chlorine (0 to 20 ppm Cl_2)
b) Low Residual Chlorine Alarm Setpoint (<0.5 ppm Cl_2)
c) High Residual Chlorine Alarm Setpoint (>1 ppm Cl_2)

4. SCADA – HMI at the Public Works Office
   a. Solenoid Valve: **SV-1055**
      1) Open/Close Status
      2) Valve Failure Alarm
   b. Chlorine Feed Smart Valve: **CHL-1052**
      1) Chlorine Concentration Setpoint
      2) Instantaneous Chlorine Feed Rate (ppd)
      3) Access to 90-day Feed Rate Trend
      4) Smart Valve Failure Alarm
   c. Chlorine Cylinder Scale: **CHL-060**: Common equipment, comply with requirements under "G" above for Well 9.Scale Failure Alarm
   d. Chlorine Gas Leak Detector: **CHL-065:** Common equipment, comply with requirements under "G" above for Well 9.
   e. Chlorine Analyzer: **CLA-069**
      a) Residual Chlorine Concentration
      b) Low Residual Chlorine Alarm Setpoint
      c) High Residual Chlorine Alarm Setpoint
      d) Sensor Failure Alarm

K. **Future** Tag Series: **1100, 1120, 1130, 1150, 1160**

1. Area: Future Well 11 located exterior to the Well House and 500-ft+/- west.

2. Equipment & Devices: Per the PIDs, future well and treatment equipment is identical to Well 10.
3. Narrative: Controls contractor (CST) shall design the PLC to accommodate future operations of Well 11, which will have the same operating and treatment equipment as Well 10; similarly operations should match Well 10 and integrate

with the Ely Springs Wells.

END OF SECTION 25 51 00

SECTION 26 00 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including Division 00 Procurement and Contracting Requirements and Division 01 General Requirements, apply to this Section.

1.2 SUMMARY

A. This Section includes general requirements for all Division 26 work.

B. Work Included.
Furnish all labor and materials and perform all operations necessary for the installation of complete and operating electrical systems subject to the conditions of the contract. The work also includes the completion of such electrical details not mentioned or shown which are necessary for the successful operation of all systems. Prove satisfactory operation of all equipment and controls to the Engineer on request.

C. Work Not Included (Specified elsewhere).
Certain labor and materials may be furnished and/or installed under other Divisions of these specifications. Coordinate with all other applicable trades and arrange all electrical work to make the components fit together to provide complete and operational systems.

1.3 REFERENCE STANDARDS

A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. The date of the standard that is in effect at the bid date, or date of Engineer/Contractor Agreement when there are no bids, except when a specific date is specified or when the standard is part of an applicable code which includes an edition date.

C. When required by individual Specifications Section, obtain copy of standard. Maintain copy at job site during work until Substantial Completion.

D. Schedule of Referenced Organizations: See Division 01.

1.4 REGULATORY AND CODE REQUIREMENTS

A. Apply for and pay for all permits, fees, licenses and inspections for this Division of work.

B. Include the cost of any "Electric Service Application Fee" charged by the Utility Company.

C. Comply with state and local code requirements and ordinances. Comply with requirements of the

Utility Companies. In the case of differences between these requirements and ordinances, the most stringent shall govern. Call for inspections required by Local Building Inspection Authority.

D. Applicable Building Codes and Ordinances: Including but not limited to the following:

International Building Code NFPA 101 - Life Safety Code, Latest Edition
Utility Company Requirements
State Department of Labor Requirements
State Department of Health Requirements
National Fire Protection Association Standards
State and Federal Safety and Health Laws
NFPA 70 - National Electrical Code, (2014)
NFPA 72 – Fire Alarm, Latest Edition Enforced by Local Jurisdiction
Local Building Codes, Latest Editions
International Energy Conservation Code

E. References: The latest editions of the following standards (including supplements and official interpretations) are minimum requirements.

1. Underwriter's Laboratories, Inc. (UL)

2. National Electrical Manufacturers Association (NEMA)

3. American National Standards Institute (ANSI)

4. Insulated Cable Engineers Association (ICEA)

5. National Electrical Safety Code (NESC)

6. NECA Standard of Installation

1.5 DEFINITIONS

A. "Provide" means Contractor is responsible for the furnishing and installation of.

B. "Exposed" means where it can be seen after the building is completed such as in equipment rooms, unfinished areas, accessible tunnels, etc. where conduit/equipment is accessible.

C. "Concealed" means where it cannot be seen after the building is completed such as in spaces as chases, trenches, above ceilings, in walls and buried where conduit/wire is inaccessible when building is completed.

1.6 SUBMITTALS

A. Comply with Division 01 and individual Division 26 Specification Sections. Furnish number of sets as required in Division 01, but not less than three.

B. Submit shop drawings and product data for products and equipment listed in each Division 26 Specification Section. Make submittals to Engineer via the general contractor. Do not make

submittals directly to the Engineer.

1. If the shop drawings deviate from the contract documents advise the Engineer of the deviations via written format, accompanying the shop drawings. Include the reason for the deviation(s). Coordinate all required changes with the other trades affected. If the changes are occasioned by the Contractor, the Contractor shall pay any costs involved.

2. Show any changes required in electrical wiring, space allocation, etc. Contractor shall be responsible to make all changes required to accommodate these changes. Coordinate changes required with all other trades. If the changes are occasioned by the Contractor, the Contractor shall pay any costs involved.

C. Submit test reports as required in each Division 26 Specification Section.

D. Submit certificates of operation as required in each Division 26 Specification Section.

E. Where shop drawing submittals are required, do not begin work until one copy that has not been rejected or required to be resubmitted again has been returned.

F. Review of shop drawings is for general conformance with the design concept of the project and does not relieve Contractor from the responsibility of furnishing equipment and materials of proper dimension, size, quantity, quality and all performance characteristics to efficiently perform the requirements and intent of the contract documents. Review does not relieve Contractor from responsibility for errors on the shop drawings. Approval of a specific item does not include approval of the assembly of which the item is a component.

1.7 PRODUCT ALTERNATES AND SUBSTITUTIONS

A. Comply with Division 01, individual Division 26 Specification Sections and the following:

1. Should the Contractor wish to have products considered other than those specified, he/she must submit those items in accordance with Division 26 Section “Basic Electrical Requirements” and Division 01. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis

2. Action for substitutions specified herein will be given only after the receipt of complete data showing manufacturer, model number, performance criteria, physical dimensions and material construction all SPECIFICALLY marked for the individual item. Letter of transmittal with at least 1 copy of all descriptive data shall be submitted to the Engineer's office. Data may not be returned; reference addenda for approval to bid.

3. Voluntary product substitutions from the Contractor will not be considered without prior approval. Contractor will be required to submit the total savings (anticipated savings) to the Engineer.

1.8 QUALITY ASSURANCE

A. Quality Control: All work shall be completed by an electrician licensed in the State of Wyoming.

B. Preparation: Base final installation of materials and equipment on actual dimensions and conditions at the project site. Field measure for materials or equipment requiring exact fit.

C. Workmanship: All electrical work shall be performed, or under direct supervision of, a licensed electrician. Provide qualified skilled workmen, licensed as required. Perform work in accordance with ANSI/ NECA 1- 2000. The appearance of the finished work shall be of equal importance with its electrical operation. The Engineer may reject work if workmanship and appearance are not satisfactory.

D. Supervision: Be responsible for and coordinate the work of all subcontractors working under Division 26.

E. Installation Procedures: Confer and cooperate with other trades and coordinate the work in proper relation with theirs. Coordinate ceiling cavity space carefully with other trades.

1. Protection shall be provided for interior cabinet components when drilling to keep metal shavings off of electrical components in cabinet.

F. Materials: All electrical materials shall be new unless noted otherwise, and acceptable for installation only if labeled or listed as defined in NFPA 70, Article 100, by UL or by a recognized testing laboratory where standards have been established and acceptable to the Authority Having Jurisdiction. Labeled or listed equipment shall be installed in accordance with any instructions or labeling provided with the equipment.

G. Install equipment and materials in accordance with manufacturers' recommendations unless specifically indicated otherwise, or where local codes or regulations take precedence.

H. Protection: Where there are existing facilities, be responsible for the protection thereof, whether or not such facility is to be removed or relocated. Moving or removing any facility must be done so as not to cause interruption of the work or Engineer’s operation.

1.9 DELIVERY, STORAGE AND HANDLING

A. Comply with Division 01 and individual Division 26 Specification Sections.

B. Provide for proper storage of all materials and equipment and assume responsibility for losses due to any cause. All storage shall be within the contract limit lines of the building site. Off-site storage will be allowed if permitted under Division 01 requirements. Cover and store all equipment and materials out of elements and off of the ground; any rusted or weather damaged item will not be permitted to be used. Make arrangements with other contractors on the job for introduction into the building of equipment too large to pass through finished openings.

C. Acceptance: Check and sign for materials to be furnished by others for installation under Division 26 upon delivery. Assume responsibility for the storage and safekeeping of such materials from time of delivery until final acceptance.

1.10 COORDINATION

A. Inspection: Inspect work preceding or interfacing with work of Division 26 Sections and report any

known or observed defects that affect the work to the General Contractor. Do not proceed with work until defects are corrected.

B. Coordinate electrical service connections (if any) to components furnished by utility companies. Contractor shall coordinate all of their contract required activities relating to the installation of the electrical service installation through the Owner with sufficient advance notification, etc.

1. Make arrangements with Utility Companies to obtain permanent services to the project.

2. Utility interruptions: Coordinate electrical utility interruptions with the Utility Company. Plan work so that duration of the interruption is kept to a minimum.

3. Coordinate installation and connection of exterior underground and/or overhead utilities and services, including provisions for electrical-metering components.

4. Comply with requirements of Authorities Having Jurisdiction and of utility company providing electrical power and other services.

C. Existing Utilities: The plans indicate the location, type and sizes of various utilities within the site where known. These utilities are indicated as accurately as possible. If utilities are encountered during construction which are not shown on the drawings, ask for instructions from the Engineer. Any relocation or remodeling required will then be directed. Assume all responsibility for protection of all utilities, shown or not, and repair any damage caused by this construction at no extra charge to the Engineer.

1. Contractor shall be responsible for calling "Utilities Location Hot Line" to schedule underground utilities location marking.

2. Owners of all underground facilities shall be notified at least three business days prior to excavation so that the owners can locate and mark underground facilities.

D. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange

in building structure during progress of construction to facilitate the electrical installations that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

E. Sequence, coordinate and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

F. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

G. Drawings and Specifications

1. Electrical drawings are diagrammatic and because of the small scale, it is not possible to

indicate every required offset, fitting, etc. Drawings are not to be scaled for dimensions. Take all dimensions from Architectural drawings, certified equipment drawings and from the structure itself before fabricating any work. Verify all space requirements, coordinating with other trades, and install the systems in the space provided without extra charges to the Engineer.

2. Examine Drawings and Specifications for other parts of the work, and for any discrepancies. Discrepancies between different plans, between plans and specifications, between specifications, or regulations and codes governing this installation shall be brought to the attention of the Engineer. In the event such discrepancies exist and the Engineer is not so notified, the adjudication of responsibility shall be solely at the discretion of the Engineer. Obtain written instructions for any necessary changes.

3. The precedence of electrical construction documents is as follows:

   a. Addenda and modifications to the Drawings and Specifications take precedence over the original Drawings and Specifications.
   b. Should there be a conflict within the Specifications or within Drawings of the same scale, the more stringent or higher quality requirements shall apply.
   c. In the Drawings, the precedence shall be Drawings of larger scale over those of smaller scale, figured dimensions over scaled dimensions and noted materials over graphic indications.
   d. Should a conflict arise between the Drawings and the Specifications for products indicated on the Drawings, the Specifications shall have precedence.
   e. Should there be a conflict in dimensions or locations between Electrical Drawings and Architectural Drawings, the Architectural Drawings shall have precedence.

1.11 RECORD DRAWINGS

A. Comply with Section 01 77 00 – Closeout Procedures.

B. A separate set of project drawings shall be maintained at the job site at all times and shall be used as record drawings. This set shall be kept up to date with all changes and/or additions in the construction of electrical. This set of drawings shall be kept clean and protected at all times and shall be submitted to the Engineer for approval following final completion.

1.12 WARRANTIES

A. All materials and equipment shall be new unless otherwise specified.

B. Provide a written warranty to the Engineer covering the entire electrical work to be free from defective materials, equipment and workmanship for a period of one year unless noted otherwise in individual Sections, after Date of Acceptance. During this period provide labor and materials as required to repair or replace defects at no additional cost to the Engineer. Provide certificates (include in O & M Manuals) for such materials and equipment, which have warranties in excess of one year. Include dates of start and end of the warranty and manufacturer's representative name and telephone number.

1.13 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

A. General: Comply with Division 01.

B. Temporary Lighting and Power

1. Provide all temporary facilities required to supply construction power and light. Install and maintain facilities in a manner that will protect the public and workmen. Comply with all applicable laws and regulations.

2. Provide covered walkway lights and obstruction lights where required, which shall be kept burning continuously between sunset and sunrise.

3. Upon completion of the work, remove all temporary facilities from the site.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 INSTALLATION

A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Equipment: Install to facilitate service, maintenance, and repair or replacements of components. Connect for ease of disconnection, with minimum interference with other installations.

D. Right of Way: Give to raceways and piping systems installed at a required slope.

E. Waterproofing: Seal all existing openings (created by demolition) and all new openings at exterior

building foundation and wall penetrations so that they are watertight.

F. Electrical Provisions for Roofs

1. Raceways penetrating roofs shall be installed in a manner to preserve the integrity of the roof and not void warranty. Provide flashing and counter flashing for all roof penetrations required for the work.

2. All conduits routed above roofs shall be installed a minimum of twelve inches above the finished roof surface, supported on metal stands installed with flashing and counter flashing, with a maximum spacing of ten feet.

G. Trenching and Backfilling: Dig trenches to the depth required, minimum 24 inches or as specified. Concrete or sand encase conduits or cables as specified or shown. Backfill with earth in 6 inch layers. Thoroughly tamp each layer and compact to 95 percent density in accordance with

Architectural specifications. Remove all rocks, stones, etc., from bottom of trench from backfill material and exercise necessary precautions so as to avoid damage to conduit and/or cable runs. Restore subsurface and surface to original condition where trenching is done in specially treated areas, such as paving, concrete, asphalt, etc. Repair and restore trenches and surface where settlement occurs for a period of one year from date of acceptance of work by Engineer. Provide safety barriers in existing areas during all times that trench is open and whenever it will cause a hazard to drivers or pedestrians. Refer to Division 31 for additional requirements.

1. Refer to Division 27 Section "Pathways for Communications Systems" for spacing requirements between power and communications conduit and/or cable.

H. Cutting and Patching

1. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Cutting shall be performed by skilled workmen of trades involved.

2. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

I. Refinishing and Touchup Paint: Paint materials and application requirements are specified in Division 09 Painting.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.

2. Follow Paint manufacturers written instructions for surface preparation and for timing and application of successive coats.

3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

4. Repair damage to PVC or paint finished with matching touchup coating recommended by manufacturer.

J. Cleaning and Protection

1. Comply with Division 01 and individual requirements of each Divison 26 Specification Section.

2. On completion of installation, including outlets, fittings and devices, inspect exposed finish. Remove burrs, dirt, paint spots and construction debris.

3. Protect equipment and installations and maintain conditions to ensure that coatings, finished, and cabinets are without damage or deterioration at time of Substantial Completion.

3.2 FINAL OBSERVATION

A. Comply with Division 01 and individual Division 26 Specification Sections.

B. Prior to notifying the Engineer that the project is ready for the final observation the Contractor must submit the O & M manuals fifteen (15) days prior to the date of final observation or as required in Division 01, and shall verify in writing, that:

1. All systems are complete.

2. All systems have been properly started and are operational.

C. When the Contractor notifies the Engineer that the project is ready for a final observation, the Engineer will visit the job site and will prepare a final observation list of all the items on the project that shall be finished or corrected before the project can be accepted.

D. When the Contractor notifies the Engineer that all items on the above final observation list have been completed and corrected, the Engineer will visit the project to ascertain that all the items on the final observation list have been corrected and can be accepted.

3.3 PROJECT RECORD DRAWING

A. Comply with Division 01 and individual Division 26 Specification Sections.

B. File at job site one copy of Drawings, Specifications, Addenda, approved shop drawings, change orders, field orders, test records, other modifications to Contract Documents.

C. Do not use Project Record Documents for construction purposes.

D. Legibly mark with red pencil field changes, such as the following, referenced to permanent and accessible features of the site or building as applicable. Do not permanently conceal any work until required information is recorded.

1. Drawings:

   a. Locations of underground work.
   b. Locations of concealed utilities.
   c. Field changes of dimension and detail.
   d. Changes resulting from change order or field order.
   e. Details not on original drawings.
   f. Approved (should be inclusive of all variations of drawings) circuiting changes, or routing changes.
   g. Manufacturer, model number of equipment actually installed.
   h. Update all panel schedules with revised circuit numbers and loads.

2. Shop Drawings
   Changes made after Engineer's approval.

E. At completion of Work transfer all project record document information onto CADD files. Deliver

completed Project Record Documents to Engineer. Project Record Documents shall include any special system and "project record" shop drawings.

3.4 OPERATION AND MAINTENANCE DATA

A. Comply with Division 01 and individual Division 26 Specification Sections.

B. Submit number as required by Division 01, typed and hard bound copies of Operating and Maintenance Manuals to Engineer for approval prior to scheduling any system demonstration for the Engineer and fifteen (15) days prior to final observation. Books shall be arranged in sequence to match the specification Sections.

C. The books shall contain, but not be limited to, the following general items; each item shall be provided with a separate index tab.

1. Instructions (On Contractor's Letterhead Stationery) on who to call for service during guarantee period including name, address, and 24 hour telephone number of company responsible for servicing each piece of equipment or system.

2. Maintenance instructions (On Contractor's Letterhead Stationery) shall include: (can be referenced to manufacturer's manual with appropriate page numbers, etc.)

   a. Preventative maintenance schedule for necessary cleaning, lug tightening, system tests, periodic operation of emergency power systems, etc.

3. Manufacturer's manuals for each piece of equipment installed. Manuals shall include the following, as applicable:

   a. Description of unit and component parts:
      1) Function, normal operating characteristics and limiting conditions.
      2) Complete nomenclature and commercial part number of replaceable parts.
      3) Installation instruction sheets.
      4) Complete wiring diagrams.

   b. Recommended procedures:
      1) Start-up, break-in, routine lubrication (if applicable) and operating instructions and cautions.
      2) Regulation, control, start/stop, shutdown and emergency instructions.
      3) Special summer and winter operating cautions.

   c. Maintenance:
      1) Routine care.
      2) Guide to troubleshooting.
      3) Disassembly, repair and reassembly.
      4) List of required lubricants and schedule (if applicable).
      5) Parts list, illustrations, assembly drawings and diagrams required for maintenance.
      6) Predicted life of parts subject to wear.

4. All warranties provided by the Manufacturer on their equipment that run longer than the one year warranty by the Contractor.

5. All test reports.

6. All Certificates of Operation.

7. Certificate of Final Inspection.

3.5 DEMONSTRATIONS

A. Comply with Division 01 and individual Division 26 Specification Sections.

B. Conduct demonstrations only after systems have been through start-up procedures, systems are complete and operating, and operating and maintenance data is complete.

C. Instruct the Engineer's representatives on the proper operation and maintenance of the electrical systems.

D. Contractor's Representatives:

1. Contractor's representatives shall have a thorough knowledge of the particular installation.

2. Manufacturer's representatives shall have a thorough understanding of each particular piece of equipment.

E. Scheduling: Arrange and schedule demonstration times with Engineer.

F. Location: Conduct demonstrations at project including tours of systems.

G. Operating and Maintenance Data: Arrange for data to be at demonstrations. Include review of data at demonstrations.

H. Time Allotment: Provide demonstrations of adequate time periods, except as noted elsewhere, to ensure proper understanding of systems by Engineer's representative.

I. Furnish ladders, tools, etc. as required to provide access to all equipment and controls for demonstrations.

3.6 CONTRACT CLOSEOUT PROCEDURE

A. Comply with Division 01 and individual Division 26 Specification Sections.

B. Approval for final payment will not be given until all contract closeout procedures comply with Division 01 Requirements.

C. Submit Keys for electrical switches, panels, cabinets, enclosures, etc. to the General Contractor.

D. Remove all materials, scrap, etc. related to the electrical installation. Leave premises in a clean and

orderly condition.

END OF SECTION 26 00 00

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Copper building wire rated 600 V or less.
   2. Metal-clad cable, Type MC, rated 600 V or less.
   3. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Product Schedule: Indicate type, use, location, and termination locations.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alpha Wire Company.
   2. General Cable Technologies Corporation.
   3. Okonite Company (The).
   4. Southwire Company.
   5. WESCO.
   6. Approved equal.
C. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. RoHS compliant.
   3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 and ASTM B496 for stranded conductors.

E. Conductor Insulation:
   1. Type THHN and Type THWN-2: Comply with UL 83.
   2. Type THW and Type THW-2: Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
   3. Type XHHW-2: Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Alpha Wire Company.
   2. General Cable Technologies Corporation.
   3. Okonite Company (The).
   4. Southwire Company.
   5. WESCO.
C. Standards:
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
   2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors
E. Ground Conductor: Insulated.
F. Conductor Insulation:
   1. Type TFN/THHN/THWN-2: Comply with UL 83.
   2. Type XHHW-2: Comply with UL 44.
G. Armor: Steel, interlocked.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. 3M Electrical Products.
   2. ABB (Electrification Products Division).
   3. Gardner Bender.
   4. Ideal Industries, Inc.
   5. Approved equal.
C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
B. Feeders: Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors shall be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
C. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
D. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.
E. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN/THWN-2, single conductors in raceway
B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway
C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway
E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway. Coordinate "Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground" Paragraph below with Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems."
F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
B. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
F. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
    1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 05 53 "Identification for Electrical Systems."
B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
B. Perform tests and inspections and prepare test reports.
C. Tests and Inspections:
    1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
    2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
    3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
        a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
        b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

D. Test Reports: Prepare a written report to record the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 25 05 19

SECTION 26 05 23 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Backboards.
   2. Category 5e balanced twisted pair cable.
   3. Balanced twisted pair cabling hardware.
   4. RS-485 cabling.
   5. Low-voltage control cabling.
   6. Control-circuit conductors.

1.2 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency, RCDD, layout technician, installation supervisor, and field inspector.
B. Source quality-control reports.
C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Accredited by NETA.
   1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
   1. Flame Travel Distance: 60 inches (1520 mm) or less.

2. Peak Optical Smoke Density: 0.5 or less.
3. Average Optical Smoke Density: 0.15 or less.

C. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

D. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

E. RoHS compliant.

2.2 BACKBOARDS

A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches (19 by 1220 by 2440 mm).

B. Painting: Paint plywood on all sides and edges with flat latex paint.

2.3 CATEGORY 5e BALANCED TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 5e cable at frequencies up to 100 MHz.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. AMP NETCONNECT; a TE Connectivity Ltd. company.
2. Belden Inc.
3. Berk-Tek Leviton; a Nexans/Leviton alliance.
4. General Cable; Prysmian Group North America.
5. Hitachi Cable America Inc.

C. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 5e cables.

D. Conductors: 100-ohm, 24 AWG solid copper.

E. Shielding/Screening: Shielded twisted pairs (FTP).

F. Cable Rating: Plenum.

G. Jacket: thermoplastic.

2.4 BALANCED TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. 3M.
2. Belden.
3. Genesis Cable Products; Honeywell International, Inc.
4. Leviton Manufacturing Co., Inc.
5. Panduit Corp.

C. General Requirements for Balanced Twisted Pair Cable Hardware:
1. Comply with the performance requirements of Category 6.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables shall be terminated with connecting hardware of same category or higher.

D. Source Limitations: Obtain balanced twisted pair cable hardware from same manufacturer as balanced twisted pair cable, from single source.
E. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
F. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
    1. Number of Terminals per Field: One for each conductor in assigned cables.
G. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.
    1. Features:
        a. Universal T568A and T568B wiring labels.
        b. Labeling areas adjacent to conductors.
        c. Replaceable connectors.
        d. 24 or 48 ports.
    2. Construction: 16-gauge steel and mountable on 19-inch (483 mm) equipment racks.
    3. Number of Jacks per Field: One for each four-pair cable indicated.
H. Patch Cords: Factory-made, four-pair cables in 36-inch (900-mm) lengths; terminated with an eight-position modular plug at each end.
    1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
    2. Patch cords shall have color-coded boots for circuit identification.
I. Plugs and Plug Assemblies:
    1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded balanced twisted pair cable.
    2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
    3. Marked to indicate transmission performance.
J. Jacks and Jack Assemblies:
    1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100-ohm unshielded or shielded balanced twisted pair cable.
    2. Designed to snap-in to a patch panel or faceplate.
    3. Standards.
        a. Category 5e, unshielded balanced twisted pair cable shall comply with IEC 60603-7-2.
        b. Category 5e, shielded balanced twisted pair cable shall comply with IEC 60603-7-3.
        c. Category 6, unshielded balanced twisted pair cable shall comply with IEC 60603-7-4.
        d. Category 6, shielded balanced twisted pair cable shall comply with IEC 60603-7.5.
        e. Category 6a, unshielded balanced twisted pair cable shall comply with IEC 60603-7-41.
        f. Category 6a, shielded balanced twisted pair cable shall comply with IEC 60603-7.51.
    4. Marked to indicate transmission performance.
K. Faceplate:
    1. Two port, vertical single gang faceplates designed to mount to single gang wall boxes.
    2. Eight port, vertical double gang faceplates designed to mount to double gang wall boxes.
    3. Plastic Faceplate: High-impact plastic. Coordinate color with Section 26 27 26 "Wiring Devices."
    4. Metal Faceplate: Complying with requirements in Section 26 27 26 "Wiring Devices."

5. For use with snap-in jacks accommodating any combination of balanced twisted pair, optical fiber, and coaxial work area cords.
    a. Flush mounting jacks, positioning the cord at a 45-degree angle.

L. Legend:
1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 RS-232 CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Allied Wire & Cable Inc.
2. Belden Inc.
3. General Cable; Prysmian Group North America.
4. Genesis Cable Products; Honeywell International, Inc.
5. Southwire Company.

B. PVC-Jacketed, TIA 232-F:
1. Nine, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Lead Content: Less than 300 parts per million.
3. Polypropylene insulation.
4. Aluminum foil-polyester tape shield with 100 percent shield coverage.
5. PVC jacket.
6. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
7. NFPA 70 Type: Type CM.
8. Flame Resistance: Comply with UL 1581.

C. Plenum-Type, TIA 232-F:
1. Nine, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Lead Content: Less than 300 parts per million.
3. PE insulation.
4. Aluminum foil-polyester tape shield with 100 percent shield coverage.
5. Fluorinated ethylene propylene jacket.
6. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
7. Flame Resistance: Comply with NFPA 262.

2.6 RS-485 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.
1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262.
6. Lead Content: Less than 300 parts per million.

2.7 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
   1. Multi-pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
   2. PVC insulation.
   3. Unshielded.
   4. PVC jacket.
   5. Flame Resistance: Comply with NFPA 262.
   6. Lead Content: Less than 300 parts per million.

2.8 CONTROL-CIRCUIT CONDUCTORS

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>
B. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
C. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
D. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.
E. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.
   1. Smoke control signaling and control circuits.

2.9 FIRE-ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Allied Wire & Cable Inc.
   2. CommScope, Inc.
   3. Comtran Corporation.
   4. Genesis Cable Products; Honeywell International, Inc.
B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
   1. Lead Content: Less than 300 parts per million.
C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG.
   1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.
D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
   1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
   2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
   3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

2.10 SOURCE QUALITY CONTROL

A. Factory test balanced twisted pair cables according to TIA-568-C.2.
B. Cable will be considered defective if it does not pass tests and inspections.
C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Test cables on receipt at Project site.
    1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 26 05 33 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
    1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.
    2. Outlet boxes shall be no smaller than 4 inches (102 mm) square by 2-1/8 inches (53 mm) deep with extension ring sized to bring edge of ring to within 1/8 inch (3.1 mm) of the finished wall surface.
    3. Flexible metal conduit shall not be used.
B. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.
C. Install manufactured conduit sweeps and long-radius elbows if possible.
D. Raceway Installation in Equipment Rooms:
    1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
    2. Install cable trays to route cables if conduits cannot be located in these positions.
    3. Secure conduits to backboard if entering the room from overhead.
    4. Extend conduits 3 inches (75 mm) above finished floor.
    5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
E. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.
B. General Requirements for Cabling:
    1. Comply with TIA-568-C Series of standards.
    2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."

3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced and shall be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
6. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
11. Support: Do not allow cables to lay on removable ceiling tiles.
12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
13. Provide strain relief.
14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
15. Ground wire shall be copper, and grounding methods shall comply with IEEE C2. Demonstrate ground resistance.

C. Balanced Twisted Pair Cable Installation:
1. Comply with TIA-568-C.2.
2. Install termination hardware as specified in Section 27 15 13 "Communications Copper Horizontal Cabling" unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch (12 mm) at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:
1. Install wiring in raceways. Comply with requirements specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."

E. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 30 inches (760 mm) apart.
3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

F. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.

2. Install cabling after the flooring system has been installed in raised floor areas.
3. Below each feed point, neatly coil a minimum of 72 inches (1830 mm) of cable in a coil not less than 12 inches (305 mm) in diameter.

3.4 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:
   1. Class 1 remote-control and signal circuits; No 14 AWG.
   2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
   3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

A. Comply with requirements in Section 07 84 13 "Penetration Firestopping."
B. Comply with TIA-569-D, Annex A, "Firestopping."
C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
B. For low-voltage control wiring and cabling, comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.
C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire shall have a unique tag.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections with the assistance of a factory-authorized service representative.
B. Tests and Inspections:
   1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
   2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
D. Prepare test and inspection reports.

END OF SECTION 26 05 23

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.
B. Section includes grounding and bonding systems and equipment, plus the following special applications:
   1. Underground distribution grounding.
   2. Ground bonding common with lightning protection system.
   3. Foundation steel electrodes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
B. Qualification Data: For testing agency and testing agency's field supervisor.
C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.
   1. Plans showing as-built, dimensioned locations of system described in "Field Quality Control" Article, including the following:
      a. Test wells.
      b. Ground rods.
      c. Ground rings.
      d. Foundation steel electrodes
      e. Grounding arrangements and connections for separately derived systems.
   2. Instructions for periodic testing and inspection of grounding features at test wells based on NFPA 70B.
      a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
      b. Include recommended testing intervals.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Certified by NETA.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B3.
   2. Stranded Conductors: ASTM B8.
   3. Tinned Conductors: ASTM B33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32-inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
D. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
E. Water Pipe Clamps:
   1. Mechanical type, two pieces with stainless-steel bolts.
      a. Material: Die-cast zinc alloy.
      b. Listed for direct burial.
   2. U-bolt type with malleable-iron clamp and copper ground connector rated for direct burial.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel 5/8 by 96 inches.
B. Ground Plates: 1/4 inch thick, hot-dip galvanized.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.
   1. Bury at least 30 inches below grade.
C. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
   2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
D. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses in accordance with the National Electric Code.

3.3 GROUNDING SEPARATELY DERIVED SYSTEMS

A. Generator: Install grounding electrode(s) at the generator location. The electrode shall be connected to the equipment grounding conductor and to the frame of the generator.
B. Other locations denoted on plans: Install grounding electrode(s) at the designated location. The electrode shall be connected to the equipment grounding conductor and to the frame of the equipment.

3.4 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.
B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout.
C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn

copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits.

D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches from the foundation.

3.5 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
   4. Single-phase motor and appliance branch circuits.
   5. Three-phase motor and appliance branch circuits.
   6. Flexible raceway runs.
   7. Armored and metal-clad cable runs.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.6 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
   3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70; use a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
   1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
   2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding grid or to grounding electrode external to concrete.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections

B. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
   3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before any conductors are connected.
      a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
      b. Perform tests by fall-of-potential method according to IEEE 81.
   4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each

location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:
   1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
   2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
   3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
   4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
   5. Substations and Pad-Mounted Equipment: 5 ohms.
   6. Manhole Grounds: 10 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel slotted support systems.
   2. Conduit and cable support devices.
   3. Support for conductors in vertical conduit.
   4. Structural steel for fabricated supports and restraints.
   5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.
   6. Fabricated metal equipment support assemblies.

B. Related Requirements:
   1. Section 26 05 48.16 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame Rating: Class 1.
   2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Preformed stainless steel channels and angles with minimum 13/32-inch- diameter holes at a maximum of 8 inches o.c. in at least one surface.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Atkore International (Allied Tube & Conduit).
      b. Atkore International (Unistrut).
      c. Eaton (B-line).
      d. MIRO Industries.
      e. nVent (CADDY).
   2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.

3. Material for Channel, Fittings, and Accessories: Stainless steel, S316 or S304.
4. Channel Width: 1-5/8 inches.
5. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
6. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1) Hilti, Inc.
2) ITW Ramset/Red Head; Illinois Tool Works, Inc.
2. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M,Grade A325.
5. Toggle Bolts: Stainless-steel springhead type.
6. Hanger Rods: Threaded steel.

2.3 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 05 50 00 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
   1. NECA 1.
   2. NECA 101
   3. NECA 102.
   4. NECA 105.
   5. NECA 111.
B. Comply with requirements in Section 07 84 13 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
C. Comply with requirements for raceways and boxes specified in Section 26 05 33 "Raceways and Boxes for Electrical Systems."
D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for MT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps or single-bolt conduit clamps
F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
B. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC and RMC may be supported by openings through structure members, according to NFPA 70.
C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater.

Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69 or Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 05 50 00 "Metal Fabrications" for site-fabricated metal supports.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
C. Field Welding: Comply with AWS D1.1/D1.1M.

END OF SECTION 26 05 29

SECTION 26 05 33 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal conduits and fittings.
   2. Nonmetallic conduits and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Nonmetal wireways and auxiliary gutters.
   5. Surface raceways.
   6. Boxes, nclosures, and cabinets.
   7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:
   1. Section 07 84 13 "Penetration Firestopping" for firestopping at conduit and box entrances.
   2. Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
   3. Section 27 05 28 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

A. Metal Conduit:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABB (Electrification Products Division).
b. Electri-Flex Company.
c. NEC, Inc.
d. Southwire Company.
e. Western Tube and Conduit Corporation.
f. Wheatland Tube Company.

2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. ARC: Comply with ANSI C80.5 and UL 6A.
5. IMC: Comply with ANSI C80.6 and UL 1242.
6. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
   a. Comply with NEMA RN 1.
   b. Coating Thickness: 0.040 inch, minimum.
7. EMT: Comply with ANSI C80.3 and UL 797.
8. FMC: Comply with UL 1; zinc-coated steel or aluminum.
9. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.
1. Fittings, General: Listed and labeled for type of conduit, location, and use.
2. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
3. Fittings for EMT:
   a. Material: Steel.
   b. Type: compression.
4. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
5. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Anamet Electrical, Inc (Anaconda Sealtite).
   b. Cantex Inc.
   c. CertainTeed Corporation.
   d. Condux International, Inc.
   e. Electri-Flex Company.
   f. Hubbell Incorporated (Raco Taymac Bell).

B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
1. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

2. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

C. Nonmetallic Fittings:
1. Fittings, General: Listed and labeled for type of conduit, location, and use.
2. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB (Electrification Products Division).
2. Eaton (B-line).
3. Hubbell Incorporated (Wiegmann).
4. MonoSystems, Inc.
5. nVent (Hoffman).
6. Schneider Electric USA (Square D).

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 3R unless otherwise indicated, and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Allied Moulded Products, Inc.
2. Hoffman; a Pentair company.
3. Lamson & Sessions; Carlon Electrical Products.
4. Niedax-Kleinhuis USA, Inc.

B. Description: Sheet metal, complying with UL 870 Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

E. Solvents and Adhesives: As recommended by conduit manufacturer.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Adalet.

2. Eaton (Crouse-Hinds).
3. Erickson Electrical Equipment Company.
4. FSR Inc.
5. Hubbell Incorporated.
6. Legrand North America, LLC (Wiremold).
7. Milbank Manufacturing Co.
8. MonoSystems, Inc.
9. nVent (Hoffman).
10. Oldcastle Enclosure Solutions.
11. Spring City Electrical Manufacturing Company.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Metal Floor Boxes:
1. Material: Cast metal or sheet metal.
2. Type: Fully adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Nonmetallic Floor Boxes: Nonadjustable, rectangular.
1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

H. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

I. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

J. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

K. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

L. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

M. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

N. Gangable boxes are prohibited.

O. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 3R with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

P. Cabinets:
1. NEMA 250, Type 3R galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.

2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:
   1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
   2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armorcast Products Company.
      b. Hubbell Incorporated (Quazite).
      c. NewBasis.
      d. Oldcastle Precast, Inc.
   2. Standard: Comply with SCTE 77.
   3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
   4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   6. Cover Legend: Molded lettering, "ELECTRIC" for power conductors and "COM" for communication.
   7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Armorcast Products Company.
      b. Hubbell Incorporated (Quazite).
      c. NewBasis.
      d. Nordic Fiberglass, Inc.
      e. Oldcastle Precast, Inc.
   2. Standard: Comply with SCTE 77.
   3. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
   4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
   5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
   6. Cover Legend: Molded lettering, "ELECTRIC" for power and "COM" for communication.

7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: EMT.
   3. Underground Conduit: RNC, Type EPC-40-PVC,.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
      c. Mechanical rooms.
      d. Gymnasiums.
   4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   6. Damp or Wet Locations: GRC.
   7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 3/4-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   3. EMT: Use compression, steel fittings. Comply with NEMA FB 2.10.
   4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
C. Do not install raceways or electrical items on any "explosion-relief" walls or rotating equipment.
D. Do not fasten conduits onto the bottom side of a metal deck roof.
E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
F. Comply with requirements in Section 26 05 29 "Hangers and Supports for Electrical Systems" for hangers and supports.
G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
J. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
K. Support conduit within 12 inches of enclosures to which attached.
L. Raceways Embedded in Slabs:
    1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
    2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
    3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
    4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
    5. Change to GRC before rising above floor.
M. Stub-ups to Above Recessed Ceilings:
    1. Use EMT, IMC, or RMC for raceways.
    2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
N. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
O. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
P. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
Q. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal

bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Surface Raceways:
   1. Install surface raceway with a minimum 2-inch radius control at bend points.
   2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

T. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

U. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
   2. Where an underground service raceway enters a building or structure.
   3. Conduit extending from interior to exterior of building.
   4. Conduit extending into pressurized duct and equipment.
   5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
   6. Where otherwise required by NFPA 70.

V. Expansion-Joint Fittings:
   1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
   2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
      a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
      b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
      c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
      d. Attics: 135 deg F temperature change.
   3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
   4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
   5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations subject to severe physical damage.
   2. Use LFMC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

DD. Set metal floor boxes level and flush with finished floor surface.

EE. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 31 20 00 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 31 20 00 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 31 20 00 "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
6. Underground Warning Tape: Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
D. Install handholes with bottom below frost line, below grade.
E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
    1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
    2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 26 05 33

SECTION 26 05 43 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Metal conduits and fittings, including GRC and PVC-coated steel conduit.
   2. Rigid nonmetallic duct.
   3. Flexible nonmetallic duct.
   4. Duct accessories.
   5. Precast concrete handholes.
   6. Polymer concrete handholes and boxes with polymer concrete cover.
   7. Fiberglass handholes and boxes with polymer concrete cover.
   8. Fiberglass handholes and boxes.
   9. High density plastic boxes.
   10. Precast manholes.
   11. Utility structure accessories.

1.2 DEFINITIONS

A. Direct Buried: Duct or a duct bank that is buried in the ground, without any additional casing materials such as concrete.
B. Duct: A single duct or multiple ducts. Duct may be either installed singly or as component of a duct bank.
C. Duct Bank:
   1. Two or more ducts installed in parallel, with or without additional casing materials.
   2. Multiple duct banks.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings:
   1. Precast or Factory-Fabricated Underground Utility Structures:
      a. Include plans, elevations, sections, details, attachments to other work, and accessories.
      b. Include duct entry provisions, including locations and duct sizes.
      c. Include reinforcement details.
      d. Include frame and cover design and manhole chimneys.
      e. Include ladder details.
      f. Include grounding details.
      g. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
      h. Include joint details.
   2. Factory-Fabricated Handholes and Boxes Other Than Precast Concrete:

a. Include dimensioned plans, sections, and elevations, and fabrication and installation details.
b. Include duct entry provisions, including locations and duct sizes.
c. Include cover design.
d. Include grounding details.
e. Include dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.4 INFORMATIONAL SUBMITTALS

A. Duct and Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures. Drawings shall be signed and sealed by a qualified professional engineer.
B. Qualification Data: For professional engineer and testing agency responsible for testing nonconcrete handholes and boxes.
C. Product Certificates: For concrete and steel used in precast concrete manholes and handholes, as required by ASTM C858.
D. Source quality-control reports.
E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND FITTINGS

A. GRC: Comply with ANSI C80.1 and UL 6.
B. Coated Steel Conduit: PVC-coated GRC.
   1. Comply with NEMA RN 1.
   2. Coating Thickness: 0.040 inch (1 mm), minimum.
C. RNC: NEMA TC 2, Type EPC-40-PVC and Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
D. Listed and labeled as defined in NFPA 70, by a nationally recognized testing laboratory, and marked for intended location and application.

2.2 PRECAST CONCRETE HANDHOLES AND BOXES

A. Description: Factory-fabricated, reinforced-concrete, monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or box.
B. <Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Christy Concrete Products.
   2. Elmhurst-Chicago Stone Co.
   3. Oldcastle Precast, Inc.
   4. Rinker Group, Ltd.

5. Riverton Concrete Products.

C. Comply with ASTM C858 for design and manufacturing processes.

D. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

E. Frame and Cover: Weatherproof steel frame, with steel cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing bolts.

F. Frame and Cover: Weatherproof steel frame, with hinged steel access door assembly with tamper-resistant, captive, cover-securing bolts.
   1. Cover Hinges: Concealed, with hold-open ratchet assembly.
   2. Cover Handle: Recessed.

G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

H. Cover Legend: Molded lettering, "ELECTRIC."

I. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

J. Extensions and Slabs: Designed to mate with bottom of enclosure. Same material as enclosure.
   1. Extension shall provide increased depth of 12 inches (300 mm).
   2. Slab: Same dimensions as bottom of enclosure, and arranged to provide closure.

K. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

L. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

M. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

N. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

2.3 POLYMER CONCRETE HANDHOLES AND BOXES WITH POLYMER CONCRETE COVER

A. Description: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two.

B. <Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Armorcast Products Company.
   2. MacLean Highline.
   3. Oldcastle Enclosure Solutions.

C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.

D. Color: Green.

E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

H. Cover Legend: Molded lettering, "ELECTRIC."

I. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
J. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
K. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.4 FIBERGLASS HANDHOLES AND BOXES WITH POLYMER CONCRETE FRAME AND COVER

A. Description: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Armorcast Products Company.
   2. Christy Concrete Products.
   3. Oldcastle Enclosure Solutions.
C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
D. Color: Green.
E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
H. Cover Legend: Molded lettering, "ELECTRIC."
I. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
J. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
K. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) Insert dimensions and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.5 FIBERGLASS HANDHOLES AND BOXES

A. Description: Molded of fiberglass-reinforced polyester resin, with covers made of polymer concrete.
B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Christy Concrete Products.
   2. MacLean Highline.
   3. Oldcastle Enclosure Solutions.
C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
D. Color: Green.

E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
H. Cover Legend: Molded lettering, "ELECTRIC."
I. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
J. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
K. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.6 HIGH-DENSITY PLASTIC BOXES

A. Description: Injection molded of HDPE or copolymer-polypropylene. Cover shall be made of polymer concrete.
B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Nordic Fiberglass, Inc.
   2. Oldcastle Enclosure Solutions.
   3. PenCell Plastics.
   4. Quazite; Hubbell Incorporated, Power Systems.
C. Standard: Comply with SCTE 77. Comply with tier requirements in "Underground Enclosure Application" Article.
D. Color: Green.
E. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.
F. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
G. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
H. Cover Legend: Molded lettering, "ELECTRIC."
I. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, selected to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.
J. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering duct for secure, fixed installation in enclosure wall.
K. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have factory-installed inserts for cable racks and pulling-in irons.

2.7 PRECAST MANHOLES

A. Description: One-piece units and units with interlocking mating sections, complete with accessories, hardware, and features.
B. <Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Carder Concrete Products.
2. Christy Concrete Products.
3. Oldcastle Precast, Inc.

C. Comply with ASTM C858.

D. Structural Design Loading: Comply with requirements in "Underground Enclosure Application" Article.

E. Knockout Panels: Precast openings in walls, arranged to match dimensions and elevations of approaching duct, plus an additional 12 inches (300 mm) vertically and horizontally to accommodate alignment variations.

F. Duct Entrances in Manhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

G. Ground Rod Sleeve: Provide a 3-inch (75-mm) PVC sleeve in manhole floors 2 inches (50 mm) from the wall adjacent to, but not underneath, the duct entering the structure.

H. Joint Sealant: Asphaltic-butyl material with adhesion, cohesion, flexibility, and durability properties necessary to withstand maximum hydrostatic pressures at the installation location with the ground-water level at grade.

2.8 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Boxes for 600 V and Less:
1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-10 structural load rating.
2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.
3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.
4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.
5. Cover design load shall not exceed the design load of the handhole or box.

B. Manholes: Precast concrete.
1. Units Located in Roadways and Other Deliberate Traffic Paths by Heavy or Medium Vehicles: H-20 structural load rating according to AASHTO HB 17.
2. Units Not Located in Deliberate Traffic Paths by Heavy or Medium Vehicles: H-10 load rating according to AASHTO HB 17.

2.9 EARTHWORK

A. Excavation and Backfill: Comply with Section 31 20 00 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restoration: Replace area immediately after backfilling is completed or after construction vehicle traffic in immediate area is complete].

C. Restore surface features at areas disturbed by excavation, and re-establish original grades unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

D. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching. Comply with Section 32 92 00 "Turf and Grasses" and Section 32 93 00 "Plants."

E. Cut and patch existing pavement in the path of underground duct, duct bank, and underground structures according to "Cutting and Patching" Article in Section 01 73 00 "Execution."

2.10 INSTALLATION OF CONCRETE MANHOLES, HANDHOLES, AND BOXES

A. Precast Concrete Handhole and Manhole Installation:
   1. Comply with ASTM C891 unless otherwise indicated.
   2. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances.
   3. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1-inch (25-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

B. Elevations:
   1. Manhole Roof: Install with rooftop at least 15 inches (375 mm) below finished grade.
   2. Manhole Frame: In paved areas and trafficways, set frames flush with finished grade. Set other manhole frames 1 inch (25 mm) above finished grade.
   3. Install handholes with bottom below frost line, below grade.
   4. Handhole Covers: In paved areas and trafficways, set surface flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
   5. Where indicated, cast handhole cover frame integrally with handhole structure.

C. Drainage: Install drains in bottom of manholes where indicated. Coordinate with drainage provisions indicated.

D. Manhole Access: Circular opening in manhole roof; sized to match cover size.
   1. Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.
   2. Install chimney, constructed of precast concrete collars and rings, to support cast-iron frame to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for frame to chimney.

E. Waterproofing: Apply waterproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Waterproofing materials and installation are specified in Section 07 13 53 "Elastomeric Sheet Waterproofing." After duct has been connected and grouted, and before backfilling, waterproof joints and connections, and touch up abrasions and scars. Waterproof exterior of manhole chimneys after mortar has cured at least three days.

F. Dampproofing: Apply dampproofing to exterior surfaces of manholes and handholes after concrete has cured at least three days. Dampproofing materials and installation are specified in Section 07 11 13 "Bituminous Dampproofing." After ducts are connected and grouted, and before backfilling, dampproof joints and connections, and touch up abrasions and scars. Dampproof exterior of manhole chimneys after mortar has cured at least three days.

G. Hardware: Install removable hardware, including pulling eyes, cable stanchions, and cable arms, and insulators, as required for installation and support of cables and conductors and as indicated.

H. Fixed Manhole Ladders: Arrange to provide for safe entry with maximum clearance from cables and other items in manholes.

I. Field-Installed Bolting Anchors in Manholes and Concrete Handholes: Do not drill deeper than 3-7/8 inches (97 mm) for manholes and 2 inches (50 mm) for handholes, for anchor bolts installed in the field. Use a minimum of two anchors for each cable stanchion.

2.11 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.
B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.
D. Install handholes and boxes with bottom below frost line, below grade.
E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in enclosure.
F. Field cut openings for duct according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.
G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.
    1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 03 30 00 "Cast-in-Place Concrete," with a troweled finish.
    2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

2.12 GROUNDING

A. Ground underground ducts and utility structures according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

2.13 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
    1. Demonstrate capability and compliance with requirements on completion of installation of underground duct, duct bank, and utility structures.
    2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide a minimum 12-inch- (300-mm-) long mandrel equal to duct size minus 1/4 inch (6 mm). If obstructions are indicated, remove obstructions and retest.
    3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 05 26 "Grounding and Bonding for Electrical Systems."
B. Correct deficiencies and retest as specified above to demonstrate compliance.
C. Prepare test and inspection reports.

2.14 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of duct until duct cleaner indicates that duct is clear of dirt and debris. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump.
   1. Sweep floor, removing dirt and debris.
   2. Remove foreign material.

END OF SECTION 26 05 43

SECTION 26 05 44 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Sleeve-seal systems.
   3. Sleeve-seal fittings.
   4. Grout.
   5. Silicone sealants.

B. Related Requirements:
   1. Division 07 Section "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
   2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:
   1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
   2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
F. Sleeves for Rectangular Openings:
    1. Material: Galvanized sheet steel.
    2. Minimum Metal Thickness:
        a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
        b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
    1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
        a. Advance Products & Systems, Inc.
        b. CALPICO, Inc.
        c. Metraflex Company (The).
        d. Pipeline Seal and Insulator, Inc.
        e. Proco Products, Inc.
    3. Sealing Elements: Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
    4. Pressure Plates: Carbon steel.
    5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
    1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
    2. Basis-of-Design Product: Subject to compliance with requirements, provide product comparable to one of the following:
        a. Presealed Systems.
        b. GPT Industries
        c. Metraflex

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
   2. Sealant shall have VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.
B. Comply with NEMA VE 2 for cable tray and cable penetrations.
C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
   1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
      a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
      b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
   2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
   3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
   5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
C. Secure nailing flanges to concrete forms.
D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44

SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Isolation pads.
   2. Spring isolators.
   3. Restrained spring isolators.
   4. Channel support systems.
   5. Restraint cables.
   6. Hanger rod stiffeners.
   7. Anchorage bushings and washers.

B. Related Sections include the following:
   1. Division 26 Section "Hangers and Supports for Electrical Systems" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS

A. The IBC: International Building Code.
B. ICC-ES: ICC-Evaluation Service.
C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:
   1. As defined by the site structural engineer

1.5 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
   2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
      a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to the Engineer.
      b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Restrained-Isolation Devices: Include ratings for horizontal, vertical, and combined loads.

B. Delegated-Design Submittal: For seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
      a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 26 Sections for equipment mounted outdoors.
   2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
   3. Field-fabricated supports.
   4. Seismic-Restraint Details:
      a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
      b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events.
      c. Preapproval and Evaluation Documentation: By an agency acceptable to the Engineer showing maximum ratings of restraint items and the basis for approval (tests or calculations).

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.
B. Qualification Data: For professional engineer and testing agency.
C. Welding certificates.
D. Field quality-control test reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.
E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
C. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
   1. Ace Mountings Co., Inc.
   2. Amber/Booth Company, Inc.
   3. California Dynamics Corporation.
   4. Isolation Technology, Inc.
   5. Kinetics Noise Control.
   6. Mason Industries.
   7. Vibration Eliminator Co., Inc.
   8. Vibration Isolation.
   9. Vibration Mountings & Controls, Inc.
D. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.
   1. Resilient Material: Oil- and water-resistant neoprene
E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
   1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
   4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
   5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch-thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
   6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.
   1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
   2. Restraint: Seismic or limit-stop as required for equipment and authorities having jurisdiction.
   3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
   4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
   5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.

6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
C. Basis-of-Design Product: Subject to compliance with requirements, provide a comparable product by one of the following:
   1. Amber/Booth Company, Inc.
   2. California Dynamics Corporation.
   3. Cooper B-Line, Inc.; a division of Cooper Industries.
   4. Hilti Inc.
   5. Loos & Co.; Seismic Earthquake Division.
   6. Mason Industries.
   7. TOLCO Incorporated; a brand of NIBCO INC.
   8. Unistrut; Tyco International, Ltd.
D. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to the Engineer.
E. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.
F. Hanger Rod Stiffener: [Steel tube or steel slotted-support-system sleeve with internally bolted connections] [Reinforcing steel angle clamped] to hanger rod. Do not weld stiffeners to rods.
G. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.
H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.
I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.
J. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
K. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
   1. Powder coating on springs and housings.
   2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
   3. Baked enamel or powder coat for metal components on isolators for interior use.
   4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to the Engineer.
B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.
C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:
   1. Install restrained isolators on electrical equipment.
   2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
   3. Install seismic-restraint devices using methods approved by the Engineer, providing required submittals for component.
B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
D. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engineer will engage a qualified testing agency to perform tests and inspections and prepare test reports.
B. Perform tests and inspections.
C. Tests and Inspections:
   1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
   2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
   3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
   4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
   5. Test to 90 percent of rated proof load of device.
   6. Measure isolator restraint clearance.
   7. Measure isolator deflection.
   8. Verify snubber minimum clearances.
   9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.
D. Remove and replace malfunctioning units and retest as specified above.
E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after isolated equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
C. Adjust active height of spring isolators.
D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 26 05 48

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Identification for raceways.
   2. Identification of power and control cables.
   3. Identification for conductors.
   4. Underground-line warning tape.
   5. Warning labels and signs.
   6. Instruction signs.
   7. Equipment identification labels.
   8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.
B. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.
C. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.
B. Comply with NFPA 70.
C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
D. Comply with ANSI Z535.4 for safety signs and labels.
E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
C. Coordinate installation of identifying devices with location of access panels and doors.
D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
B. Colors for Raceways Carrying Circuits at 600 V or Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage and system or service type.
C. Colors for Raceways Carrying Circuits at More Than 600 V:
   1. Black letters on an orange field.
   2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.
D. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
E. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
F. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
G. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers diagonally over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stop stripes at legends.
H. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.
I. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
B. Colors for Raceways Carrying Circuits at 600 V and Less:
   1. Black letters on an orange field.
   2. Legend: Indicate voltage and system or service type.

C. Colors for Raceways Carrying Circuits at More Than 600 V:
   1. Black letters on an orange field.
   2. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high letters on 20-inch (500-mm) centers.

D. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

E. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches (50 mm) wide; compounded for outdoor use.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch (50 by 50 by 1.3 mm), with stamped legend, punched for use with self-locking cable tie fastener.

D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

E. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

F. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 UNDERGROUND-LINE WARNING TAPE

A. Tape:
   1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   2. Printing on tape shall be permanent and shall not be damaged by burial operations.
   3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
B. Color and Printing:
   1. Comply with ANSI Z535.1 through ANSI Z535.5.
   2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
   3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.7 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.
B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
C. Baked-Enamel Warning Signs:
   1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
   2. 1/4-inch (6.4-mm) grommets in corners for mounting.
   3. Nominal size, 7 by 10 inches (180 by 250 mm).
D. Metal-Backed, Butyrate Warning Signs:
   1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
   2. 1/4-inch (6.4-mm) grommets in corners for mounting.
   3. Nominal size, 10 by 14 inches (250 by 360 mm).
E. Warning label and sign shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.8 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.9 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.10 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
   4. Color: Black except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
   3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
   4. Color: Black.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
   1. Minimum Width: 3/16 inch (5 mm).
   2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
   3. UL 94 Flame Rating: 94V-0.

4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
5. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.
B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
C. Apply identification devices to surfaces that require finish after completing finish work.
D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.
I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.
J. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways, Armored and Metal-Clad Cables, More Than 600 V: Self-adhesive vinyl labels. Install labels at 30-foot (10-m) maximum intervals.

C. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 30-foot (10-m) maximum intervals.

D. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
1. Emergency Power.
2. Power.
3. UPS.

E. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
   a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
   b. Colors for 208/120-V Circuits:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
   c. Colors for 480/277-V Circuits:
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
   d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

F. Power-Circuit Conductor Identification, More than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic plastic tag holder with adhesive-backed phase tags, and a separate tag with the circuit designation.

G. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

H. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

J. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
   1. Limit use of underground-line warning tape to direct-buried cables.
   2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

K. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

L. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
   1. Comply with 29 CFR 1910.145.
   2. Identify system voltage with black letters on an orange background.
   3. Apply to exterior of door, cover, or other access.
   4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
      b. Controls with external control power connections.

M. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

N. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

O. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
   1. Labeling Instructions:
      a. Indoor Equipment: Adhesive film label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
      b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
      c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
      d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
   2. Equipment to Be Labeled:
      a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved engraved, laminated acrylic or melamine label.
      b. Enclosures and electrical cabinets.
      c. Access doors and panels for concealed electrical items.
      d. Switchgear.

e. Switchboards.
f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
g. Substations.
h. Emergency system boxes and enclosures.
i. Motor-control centers.
j. Enclosed switches.
k. Enclosed circuit breakers.
l. Enclosed controllers.
m. Variable-speed controllers.
n. Push-button stations.
o. Power transfer equipment.
p. Contactors.
q. Remote-controlled switches, dimmer modules, and control devices.
r. Battery-inverter units.
s. Battery racks.
t. Power-generating units.
u. Monitoring and control equipment.
v. UPS equipment.

END OF SECTION 26 05 53

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Time switches.
   2. Photoelectric switches.
   3. Standalone daylight-harvesting switching and dimming controls.
   4. Indoor occupancy and vacancy sensors.
   5. Switchbox-mounted occupancy and vacancy sensors
   6. Digital timer light switches.
   7. High-bay occupancy and vacancy sensors.
   8. Outdoor motion sensors.
   9. Lighting contactors.

B. Related Requirements:
   1. Section 26 27 26 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.2 WORK INCLUDED

1.3 Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.

1.4 Contractor/Supplier shall examine all general specification provisions and drawings for related electrical work required as work under Division 16.

1.5 Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

1.6 SYSTEM DESCRIPTION

1.7 The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.

1.8 The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.

1.9 DALI:

1.10 Components: Individually addressable devices (such as ballasts, relays, dimmers, and switches) that are operated from digital signals received through a DALI-compliant bus, from data-entry and -retrieval devices (such as computers, Internet portals, hand-held IR programming devices, wired Ethernet hubs, wireless IEEE 802.11 hubs[, and] <Insert digital communications device>). Devices also report status to data-entry and -retrieval devices though the bus.

1.11 Digital Control: Use peer-to-peer communication and distributed logic, where the failure of any single component shall be automatically isolated and not affect global system functions.

1.12 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings:
    1. Show installation details for the following:
        a. Occupancy sensors.

b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.13 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale and coordinated with each other, using input from installers of the items involved. Drawing to include layout of devices with associated model numbers.
B. Field quality-control reports.
C. Sample warranty.

1.14 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.
B. Software and firmware operational documentation.

1.15 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
1. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Leviton Manufacturing Co., Inc.
4. Lutron
B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Programs: Insert number channels; each channel is individually programmable with two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
4. Astronomic Time: Selected channels.
5. Automatic daylight savings time changeover.
6. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Cooper Industries, Inc.
   2. Intermatic, Inc.
   3. Leviton Manufacturing Co., Inc.

B. Description: Solid state; one set of NO dry contacts rated for 24 V dc at 1 A, to operate connected load, complying with UL 773, and compatible with lighting control panelboard.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range.
   3. Time Delay: Thirty-second minimum, to prevent false operation.
   4. Mounting: 1/2-inch (13-mm) threaded male conduit.
   5. Failure Mode: Luminaire stays ON.
   6. Power Pack: Digital controller capable of accepting four RJ45 inputs with two outputs rated for 20-A incandescent or LED load at 120- and 277-V ac, for 16-A ballast or LED at 120- and 277-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.
      a. With integral current monitoring
      b. Compatible with digital addressable lighting interface.
      c. Plenum rated.

2.3 INDOOR OCCUPANCY AND VACANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Cooper Industries, Inc.
   2. Lutron Electronics Co., Inc.
   3. Wattsopper (Legrand).

B. General Requirements for Sensors:
   1. Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
   2. Dual technology.
   3. Integrated power pack.
   4. Hardwired connection to switch and BAS.
   5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   6. Operation:
      a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
      b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
      c. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn

off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

7. Sensor Output: Sensor is powered from the power pack and capable of 0-10V dimming.
8. Power: Line voltage.
9. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
10. Mounting:
    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.
13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.

C. PIR Type: Wall or Ceiling mounted; detect occupants in coverage area by their heat and movement.
    1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
    2. Detection Coverage (Corridor, Ceiling Mounted): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.

D. Ultrasonic Type: Ceiling or wall mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.

1. Comparable devices from the Wattstopper “Digital Lighting Management Series” to those listed above are acceptable.
2. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
4. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
5. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
6. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).
7. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters) when mounted84 inches (2100 mm) above finished floor.
8. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180˚ coverage capability.
9. Wall switch sensors shall have no leakage current to load, in manual or in Auto/Off mode for safety purposes and shall have voltage drop protection.
10. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from automatic-ON to manual-ON.

11. Wall switch sensors shall utilize a hard lens with a minimum 1.0mm thickness. Products utilizing a soft lens will not be considered.
12. Passive infrared sensors shall provide high immunity to false triggering from RFI (hand-held radios) and EMI (electrical noise on the line).
13. Passive infrared sensors shall have a multiple segmented Fresnel lens, in a multiple-tier configuration, with grooves-in to eliminate dust and residue build-up.
14. Passive infrared ultrasonic and dual technology sensors shall be able to accommodate dual level lighting.
15. Dual technology sensors shall be wall mounted, corner mounted, or ceiling mounted in such a way as to minimize coverage in unwanted areas.
16. Dual technology sensors shall consist of passive infrared and ultrasonic technologies for occupancy detection. Products that react to noise or ambient sound shall not be considered.
17. Ultrasonic sensors shall adjust the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.
18. Ultrasonic operating frequency shall be crystal controlled to assure reliable performance and eliminate sensor cross-talk. Sensors using multiple frequencies are not acceptable.
19. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.
20. When specified, sensors shall automatically adjustable time delay and sensitivity settings.
21. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.
22. In the event of failure, a bypass manual override shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. This control shall be recessed to prevent tampering.
23. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
24. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.
25. All sensors shall have UL rated, 94V-0 plastic enclosures.

E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
   1. Sensitivity Adjustment: Separate for each sensing technology.
   2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
   4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 square feet (110 square meters) when mounted48 inches (1200 mm) above finished floor.

2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Cooper Industries, Inc.
   2. Lutron Electronics Co., Inc.
   3. Wattsopper (Legrand).

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox using hardwired connection.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
   4. Switch Rating: Not less than 800-VA ballast or LED load at 120 V, 1200-VA ballast or LED load at 277 V, and 800-W incandescent.

2.5 OUTDOOR MOTION SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Cooper Industries, Inc.
   2. WattStopper; Legrand North America, LLC.
   3. Lutron.

B. Description: Solid-state outdoor motion sensors.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Dual-technology (PIR and ultrasonic) type, weatherproof. Detect occurrences of 6-inch-(150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm). Comply with UL 773A.
   3. Switch Rating:
      a. Luminaire-Mounted Sensor: 1000-W incandescent, 500-VA fluorescent/LED.
      b. Separately Mounted Sensor: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   4. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off." With bypass switch to override the "on" function in case of sensor failure.
   5. Voltage: Match the circuit voltage type.
   6. Detector Coverage:
      a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
      b. Long Range: 180-degree field of view and 110-foot (34-m) detection range.
   7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
   8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.

9. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
10. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.
11. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F (minus 40 to plus 54 deg C), rated as "raintight" according to UL 773A.

2.6 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Allen-Bradley/Rockwell Automation.
   2. ASCO Power Technologies.
   3. Eaton.
   4. Square D; Schneider Electric USA.

B. Description: Electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
   1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
   2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
   3. Enclosure: Comply with NEMA 250.
   4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.7 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

C. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
D. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Section 26 05 53 "Identification for Electrical Systems."
B. Label time switches and contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
    1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
    2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
B. Lighting control devices will be considered defective if they do not pass tests and inspections.
C. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
    1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
    2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
    3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.6 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.

B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
   1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 26 09 23

SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
   1. Distribution transformers.
   2. Buck-boost transformers.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.
B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
      b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
B. Qualification Data: For testing agency.
C. Source quality-control test reports.
D. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
   1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.

C. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.8 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACME Electric Corporation; Power Distribution Products Division.
2. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
3. Controlled Power Company.
4. Eaton Electrical Inc.; Cutler-Hammer Products.
5. Federal Pacific Transformer Company; Division of Electro-Mechanical Corp.
6. General Electric Company.
7. Hammond Co.; Matra Electric, Inc.
8. Magnetek Power Electronics Group.
9. Micron Industries Corp.
10. Myers Power Products, Inc.
11. Siemens Energy & Automation, Inc.
12. Sola/Hevi-Duty.
13. Square D; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
B. Cores: Grain-oriented, non-aging silicon steel.
C. Coils: Continuous windings without splices except for taps.
   1. Internal Coil Connections: Brazed or pressure type.
   2. Coil Material: Copper.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.
B. Provide transformers that are constructed to withstand seismic forces specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
C. Cores: One leg per phase.
D. Enclosure: Totally enclosed, nonventilated, NEMA 250, Type 2.
   1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
E. Enclosure: Totally enclosed, nonventilated, NEMA 250, Type 3R.
   1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.
F. Transformer Enclosure Finish: Comply with NEMA 250.
   1. Finish Color: Gray.
G. Taps for Transformers Smaller Than 3 kVA: One 5 percent tap above normal full capacity.
H. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
I. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and four 2.5 percent taps below normal full capacity.
J. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 80 deg C rise above 40 deg C ambient temperature.
K. Energy Efficiency for Transformers Rated 15 kVA and Larger:
   1. Complying with NEMA TP 1, Class 1 efficiency levels.
   2. Tested according to NEMA TP 2.

L. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.
   1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
   2. Indicate value of K-factor on transformer nameplate.

M. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.
   1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
   2. Include special terminal for grounding the shield.
   3. Shield Effectiveness:
      a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
      b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
      c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.

N. Wall Brackets: Manufacturer's standard brackets.

O. Fungus Proofing: Permanent fungicidal treatment for coil and core.

P. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.4 BUCK-BOOST TRANSFORMERS

A. Description: Self-cooled, two-winding dry type, rated for continuous duty and with wiring terminals suitable for connection as autotransformer. Transformers shall comply with NEMA ST 1 and shall be listed and labeled as complying with UL 506 or UL 1561.

B. Enclosure: Ventilated, NEMA 250, Type 2.
   1. Finish Color: Gray.

2.5 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

2.6 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
D. Verify that ground connections are in place and requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
   1. Brace wall-mounting transformers as specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
B. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions[, seismic codes applicable to Project,] and requirements in Division 26 Section "Hangers and Supports for Electrical Systems."

3.3 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Contracting officer will engage a qualified testing agency to perform tests and inspections and prepare test reports.
B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
C. Perform tests and inspections and prepare test reports.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
D. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
E. Remove and replace units that do not pass tests or inspections and retest as specified above.
F. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
   1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
   2. Perform 2 follow-up infrared scans of transformers, one at 4 months and the other at 11 months after Substantial Completion.

3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

G. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Connect buck-boost transformers to provide nameplate voltage of equipment being served, plus or minus 5 percent, at secondary terminals.

C. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 26 22 00

SECTION 26 23 00 - LOW-VOLTAGE SWITCHGEAR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes metal-enclosed, low-voltage power circuit-breaker switchgear rated 1000 V and less for use in ac systems.

1.3 DEFINITIONS

A. ATS: Acceptance Testing Service.
B. GFCI: Ground-fault circuit interrupter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of switchgear, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
B. Shop Drawings: For each type of switchgear and related equipment.
   1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Include the following:
      a. Tabulation of installed devices with features and ratings.
      b. Enclosure types and details.
      c. Outline and general arrangement drawing showing dimensions, shipping sections, and weights of each assembled section.
      d. Bus configuration with size and number of conductors in each bus run, including phase, neutral, and ground conductors of main and branch buses.
      e. Current rating of buses.
      f. Short-time and short-circuit current rating of switchgear assembly.
      g. Nameplate legends.
      h. Mimic-bus diagram.
      i. Utility company's metering provisions with indication of approval by utility company.
   2. Wiring Diagrams: Power, signal, and control wiring.
C. Samples: Representative portion of mimic bus with specified finish. Manufacturer's color charts showing colors available for mimic bus.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Floor plans showing dimensioned layout, required working clearances, and required area above and around switchgear where pipe and ducts are prohibited. Show

switchgear layout and relationships between components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

B. Manufacturer Seismic Qualification Certification: Submit certification that switchgear, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
   1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
      a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For switchgear and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Six of each type and rating used. Include spares for potential transformer fuses, control power fuses, and fuses and fusible devices for fused circuit breakers.
   2. Indicating Lights: Six of each type installed.
   3. Touchup Paint: 1 containers of paint matching enclosure finish, each 0.5 pint.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
   1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Source Limitations: Obtain switchgear through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of switchgear and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver switchgear in sections of lengths that can be moved past obstructions in delivery path.
B. Store switchgear indoors in clean dry space with uniform temperature to prevent condensation. Protect switchgear from exposure to dirt, fumes, water, corrosive substances, and physical damage.
C. If stored in areas subjected to weather, cover switchgear to provide protection from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside switchgear; install electric heating (250 W per section) to prevent condensation.

1.10 PROJECT CONDITIONS

A. Installation Pathway: Remove and replace building components and structures to provide pathway for moving switchgear into place.
B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
    1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electric service.
    2. Do not proceed with interruption of electric service without Construction Manager's written permission.
C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchgear, including clearances between switchgear, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
D. Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:
    1. Ambient Temperature: Not exceeding 40 deg C. Low design temperature -35 deg C.
    2. Altitude: Not exceeding 6600 feet.

1.11 COORDINATION

A. Coordinate layout and installation of switchgear and components with other construction that penetrates ceilings or is supported by them, including conduit, piping, equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels.
B. Coordinate size and location of concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Square D; Schneider Electric.
   2. Cutler-Hammer, Inc.; Eaton Corporation.
   3. General Electric Company.
   4. Siemens Energy & Automation, Inc.

2.2 FABRICATION

A. Factory assembled and tested and complying with IEEE C37.20.1.
B. Indoor Enclosure Material: Steel.
C. Outdoor Enclosure Material: Galvanized steel.
D. Outdoor Enclosure Fabrication Requirements: Weatherproof; integral structural-steel base frame with factory-applied asphaltic undercoating; and each compartment equipped with the following features:
   1. Structural design and anchorage adequate to resist loads imposed by 105-mph wind.
   2. Space heater operating at one-half or less of rated voltage, sized to prevent condensation.
   3. Louvers equipped with insect and rodent screen and filter; arranged to permit air circulation while excluding insects, rodents, and exterior dust.
   4. Hinged front door with padlocking provisions.
   5. Interior light with switch.
   6. Weatherproof duplex receptacle.
E. Finish: IEEE C37.20.1, manufacturer's standard gray finish over a rust-inhibiting primer on phosphatizing-treated metal surfaces.
F. Section barriers between main and tie circuit-breaker compartments shall be extended to rear of section.
G. Bus isolation barriers shall be arranged to isolate line bus from load bus at each main and tie circuit breaker.
H. Auxiliary Compartments: Match and align with basic switchgear assembly. Include the following:
   1. Main breaker/ Incoming-line pull sections.
   2. Distribution Section.
      a. Cable Supports: Arranged to ease cabling and adequate to support cables indicated, including those for future installation.
I. Bus bars connect between vertical sections and between compartments. Cable connections are not permitted.
   1. Main Phase Bus: Uniform capacity the entire length of assembly.
   2. Neutral Bus: 100 percent of phase-bus ampacity, except as indicated. Equip bus with pressure-connector terminations for outgoing circuit neutral conductors. Include braces for neutral-bus extensions for busway feeders.
   3. Vertical Section Bus Size: Comply with IEEE C37.20.1, including allowance for spare circuit breakers and spaces for future circuit breakers.

4. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent minimum conductivity, with copper feeder circuit-breaker line connections.
5. Phase- and Neutral-Bus Material: Silver- or tin-plated, high-strength, electrical-grade aluminum alloy, with copper or tin-plated aluminum circuit-breaker line connections.
6. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent minimum conductivity or tin-plated, high-strength, electrical-grade aluminum alloy.
7. Use silver-plated copper or tin-plated aluminum for connecting circuit-breaker line to aluminum bus.
8. Use copper for connecting circuit-breaker line to copper bus.
9. Contact Surfaces of Buses: Silver plated.
10. Feeder Circuit-Breaker Load Terminals: Silver-plated copper bus extensions equipped with pressure connectors for outgoing circuit conductors.
11. Ground Bus: Hard-drawn copper of 98 percent minimum conductivity, with pressure connector for feeder and branch-circuit ground conductors, minimum size 1/4 by 2 inches.
12. Supports and Bracing for Buses: Adequate strength for indicated short-circuit currents.
13. Neutral bus equipped with pressure-connector terminations for outgoing circuit neutral conductors. Neutral-bus extensions for busway feeders are braced.
14. Neutral Disconnect Link: Bolted, uninsulated, 1/4-by-2-inch copper bus, arranged to connect neutral bus to ground bus.
15. Provide for future extensions from either end of main phase, neutral, and ground bus by means of predrilled bolt-holes and connecting links.
16. Bus-Bar Insulation: Individual bus bars wrapped with factory-applied, flame-retardant tape or spray-applied, flame-retardant insulation.
    a. Sprayed Insulation Thickness: 3 mils, minimum.
    b. Bolted Bus Joints: Insulate with secure joint covers that can easily be removed and reinstalled.

2.3 COMPONENTS

A. Surge Arresters: Distribution class, metal-oxide-varistor type. Comply with IEEE C62.11 and NEMA LA 1.
   1. Install in cable termination compartments and connect in each phase of circuit.
   2. Coordinate rating with circuit voltage.
B. Provision for Future Devices: Equip compartments with rails, mounting brackets, supports, necessary appurtenances, and bus connections.

2.4 CIRCUIT BREAKERS

A. Description: Comply with IEEE C37.13.
B. Ratings: As indicated for continuous, interrupting, and short-time current ratings for each circuit breaker; voltage and frequency ratings same as switchgear.
C. Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:
   1. Normal Closing Speed: Independent of both control and operator.
   2. Slow Closing Speed: Optional with operator for inspection and adjustment.
   3. Stored-Energy Mechanism: Manually charged.
   4. Operation counter.

D. Trip Devices: Solid-state, overcurrent trip-device system consisting of one or two current transformers or sensors per phase, a release mechanism, and the following features:
   1. Functions: Long-time-delay, short-time-delay, and instantaneous-trip functions, independent of each other in both action and adjustment.
   2. Temperature Compensation: Ensures accuracy and calibration stability from minus 30 deg C to plus 40 deg C.
   3. Field-adjustable, time-current characteristics.
   4. Current Adjustability: Dial settings and rating plugs on trip units or sensors on circuit breakers, or a combination of these methods.
   5. Three bands, minimum, for long-time- and short-time-delay functions; marked "minimum," "intermediate," and "maximum."
   6. Pickup Points: Five minimum, for long-time- and short-time-trip functions. Equip short-time-trip function for switchable I^2t operation.
   7. Pickup Points: Five minimum, for instantaneous-trip functions.
   8. Ground-fault protection with at least three short-time-delay settings and three trip-time-delay bands; adjustable current pickup. Arrange to provide protection for the following:
      a. Three-wire circuit or system.
      b. Four-wire circuit or system.
      c. Four-wire, double-ended substation.
   9. Trip Indication: Labeled, battery-powered lights or mechanical targets on trip device to indicate type of fault.

E. Auxiliary Contacts: For interlocking or remote indication of circuit-breaker position, with spare auxiliary switches and other auxiliary switches required for normal circuit-breaker operation, quantity as indicated. Each consists of two Type "a" and two Type "b" stages (contacts) wired through secondary disconnect devices to a terminal block in stationary housing.

F. Arc Chutes: Readily removable from associated circuit breaker when it is in disconnected position, and arranged to permit inspection of contacts without removing circuit breaker from switchgear.

G. Padlocking Provisions: For installing at least three padlocks on each circuit breaker to secure its enclosure and prevent movement of drawout mechanism.

H. Key Interlocks: Arranged so keys are attached at devices indicated. Mountings and hardware are included where future installation of key-interlock devices is indicated.

I. Undervoltage Trip Devices: Adjustable time-delay and pickup voltage.

J. Shunt-Trip Devices: Where indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces where switchgear will be installed for compliance with installation tolerances, required clearances, and other conditions affecting performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with applicable portions of NECA 400.

B. Anchor switchgear assembly to 4-inch, channel-iron floor sill embedded in concrete base and attach by bolting.
   1. Sills: Select to suit switchgear; level and grout flush into concrete base.
   2. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for seismic-restraint requirements.
   3. Concrete Bases: 4 inches high, reinforced, with chamfered edges. Extend base no more than 3 inches in all directions beyond the maximum dimensions of switchgear unless otherwise indicated or unless required for seismic anchor support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, brackets, and temporary blocking of moving parts from switchgear units and components.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

B. Diagram and Instructions:
   1. Storage for Maintenance: Include a rack or holder, near the operating instructions, for a copy of maintenance manual.

3.4 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:
   1. Test insulation resistance for each switchgear bus, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

3.6 CLEANING

A. On completion of installation, inspect interior and exterior of switchgear. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

3.7 PROTECTION

A. Temporary Heating: Apply temporary heat to switchgear, according to manufacturer's written instructions, throughout periods when switchgear environment is not controlled for temperature and humidity within manufacturer's stipulated service conditions.

END OF SECTION 26 23 00

SECTION 26 24 16 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Distribution panelboards.
   2. Lighting and appliance branch-circuit panelboards.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.
B. SPD: Surge protective device.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard.
B. Shop Drawings: For each panelboard and related equipment.
   1. Include dimensioned plans, elevations, sections, and details.
   2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
   3. Detail bus configuration, current, and voltage ratings.
   4. Short-circuit current rating of panelboards and overcurrent protective devices.
   5. Include evidence of NRTL listing for SPD as installed in panelboard.
   6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
   7. Include wiring diagrams for power, signal, and control wiring.
   8. Key interlock scheme drawing and sequence of operations.
   9. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 INFORMATIONAL SUBMITTALS

A. Panelboard schedules for installation in panelboards.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.6 FIELD CONDITIONS

A. Service Conditions: NEMA PB 1, usual service conditions, as follows:
   1. Ambient temperatures within limits specified.
   2. Altitude not exceeding 6600 feet (2000 m).

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
   1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS COMMON REQUIREMENTS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Comply with NEMA PB 1.
D. Comply with NFPA 70.
E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
   1. Rated for environmental conditions at installed location.
      a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
      b. Outdoor Locations: NEMA 250, Type 3R.
      c. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
      d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
      e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
   2. Height: 84 inches (2.13 m) maximum.
   3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
   4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
F. Incoming Mains Location: Convertible between top and bottom.
G. Phase, Neutral, and Ground Buses: Copper.
H. Conductor Connectors: Suitable for use with conductor material and sizes.
   1. Material: Tin-plated aluminum.
   2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
   3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
   4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
   5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
I. NRTL Label: Panelboards shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

J. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. Schneider Electric USA (Square D).
B. Panelboards: NEMA PB 1, distribution type.
C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
   1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
D. Mains: Circuit breaker.
E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
G. Branch Overcurrent Protective Devices: Fused switches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. Schneider Electric USA (Square D).
   3. Siemens Industry, Inc., Energy Management Division.
B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
C. Mains: Circuit breaker.
D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
F. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. Schneider Electric USA (Square D).
   3. Siemens Industry, Inc., Energy Management Division.

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
   1. Thermal-Magnetic Circuit Breakers:
      a. Inverse time-current element for low-level overloads.
      b. Instantaneous magnetic trip element for short circuits.
      c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
   3. Electronic Trip Circuit Breakers:
      a. RMS sensing.
      b. Field-replaceable rating plug or electronic trip.
      c. Digital display of settings, trip targets, and indicated metering displays.
      d. Multi-button keypad to access programmable functions and monitored data.
      e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
      f. Integral test jack for connection to portable test set or laptop computer.
      g. Field-Adjustable Settings:
         1) Instantaneous trip.
         2) Long- and short-time pickup levels.
         3) Long and short time adjustments.
         4) Ground-fault pickup level, time delay, and I squared T response.
   4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
   5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
   6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
   7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
   8. Subfeed Circuit Breakers: Vertically mounted.
   9. MCCB Features and Accessories:
      a. Standard frame sizes, trip ratings, and number of poles.
      b. Breaker handle indicates tripped status.
      c. UL listed for reverse connection without restrictive line or load ratings.
      d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
      e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
      f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
      g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.
      h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
   1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 26 28 13 "Fuses."

2.6 IDENTIFICATION

A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
C. Circuit Directory: Directory card inside panelboard door, mounted in transparent card holder.

2.7 ACCESSORY COMPONENTS AND FEATURES

A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.
B. Install panelboards and accessories according to NEMA PB 1.1.
C. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
D. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
E. Mount panelboard cabinet plumb and rigid without distortion of box.
F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
G. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
H. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
I. Install filler plates in unused spaces.
J. Stub four 1-inch (27-EMT) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-EMT) empty conduits into raised floor space or below slab not on grade.
K. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Contracting officer to engage a qualified testing agency to perform tests and inspections.
B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
C. Perform tests and inspections.
    1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
D. Acceptance Testing Preparation:
    1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
    2. Test continuity of each circuit.
E. Tests and Inspections:
    1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
    2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
    3. Perform the following infrared scan tests and inspections and prepare reports:
        a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
        b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
        c. Instruments and Equipment:
            1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
F. Panelboards will be considered defective if they do not pass tests and inspections.
G. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 26 24 16

SECTION 26 27 26 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standard-grade receptacles, 125 V, 20 A.
   2. USB receptacles.
   3. GFCI receptacles, 125 V, 20 A.
   4. Toggle switches, 120/277 V, 20 A.
   5. Occupancy sensors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
C. Samples: One for each type of device and wall plate specified, in each color specified.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
B. Comply with NFPA 70.
C. RoHS compliant.
D. Comply with NEMA WD 1.
E. Device Color:
   1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
   2. SPD Devices: Blue.
   3. Isolated-Ground Receptacles: As specified above, with orange triangle on face.
F. Wall Plate Color: For plastic covers, match device color.
G. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STANDARD-GRADE RECEPTACLES, 125 V, 20 A

A. Duplex Receptacles, 125 V, 20 A:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
    b. Leviton Manufacturing Co., Inc.
    c. Pass & Seymour; Legrand North America, LLC.
    d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498 and FS W-C-596.

B. Tamper-Resistant Duplex Receptacles, 125 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
    b. Leviton Manufacturing Co., Inc.
    c. Pass & Seymour; Legrand North America, LLC.
    d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498 and FS W-C-596.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Weather-Resistant Duplex Receptacle, 125 V, 20 A “WP”
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
    b. Leviton Manufacturing Co., Inc.
    c. Pass & Seymour; Legrand North America, LLC.
    d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.
5. Marking: Listed and labeled as complying with NFPA 70, "Receptacles in Damp or Wet Locations" Article.

D. Tamper- and Weather-Resistant Duplex Receptacles, 125 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
    b. Leviton Manufacturing Co., Inc.
    c. Pass & Seymour; Legrand North America, LLC.
    d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.

3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Standards: Comply with UL 498.
5. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.3 USB RECEPTACLES

A. USB Charging Receptacles:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
      b. Leviton Manufacturing Co., Inc.
      c. Pass & Seymour; Legrand North America, LLC.
      d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
   2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.
   3. USB Receptacles: Dual and quad, USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
   4. Standards: Comply with UL 1310 and USB 3.0 devices.
B. Tamper-Resistant Duplex and USB Charging Receptacles:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
      b. Leviton Manufacturing Co., Inc.
      c. Pass & Seymour; Legrand North America, LLC.
      d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
   2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap. Integral shutters that operate only when a plug is inserted in the line voltage receptacle.
   3. Line Voltage Receptacles: Two pole, three wire, and self-grounding; NEMA WD 6, Configuration 5-20R.
   4. USB Receptacles: Dual USB Type A, 5 V dc, and 2.1 A per receptacle (minimum).
   5. Standards: Comply with UL 498, UL 1310, USB 3.0 devices, and FS W-C-596.
   6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

2.4 GFCI RECEPTACLES, 125 V, 20 A

A. Duplex GFCI Receptacles, 125 V, 20 A “GFI”:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
      b. Leviton Manufacturing Co., Inc.
      c. Pass & Seymour; Legrand North America, LLC.
      d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.

2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.

B. Tamper-Resistant Duplex GFCI Receptacles, 125 V, 20 A “GFI”:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Pass & Seymour; Legrand North America, LLC.
b. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle.
3. Configuration: NEMA WD 6, Configuration 5-20R.
4. Type: Feed through.
5. Standards: Comply with UL 498, UL 943 Class A, and FS W-C-596.
6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" Article.

C. Tamper- and Weather-Resistant, GFCI Duplex Receptacles, 125 V, 20 A “WP GFI”:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour; Legrand North America, LLC.
d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Description: Integral GFCI with "Test" and "Reset" buttons and LED indicator light. Two pole, three wire, and self-grounding. Integral shutters that operate only when a plug is inserted in the receptacle. Square face.
3. Configuration: NEMA WD 6, Configuration 5-15R.
4. Type: Feed through.
5. Standards: Comply with UL 498 and UL 943 Class A.
6. Marking: Listed and labeled as complying with NFPA 70, "Tamper-Resistant Receptacles" and "Receptacles in Damp or Wet Locations" articles.

2.5 TOGGLE SWITCHES, 120/277 V, 20 A

A. Single-Pole, Two-Pole, Three-Way, Four-Way Switches, 120/277 V, 20 A:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
b. Leviton Manufacturing Co., Inc.
c. Pass & Seymour; Legrand North America, LLC.
d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
2. Standards: Comply with UL 20 and FS W-S-896.

2.6 OCCUPANCY SENSORS

A. Wall Switch Sensor Light Switch, Dual Technology:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
      b. Leviton Manufacturing Co., Inc.
      c. Pass & Seymour; Legrand North America, LLC.
      d. Wiring Device-Kellems; Hubbell Incorporated, Commercial and Industrial.
   2. Description: Switchbox-mounted, combination lighting-control sensor and conventional switch lighting-control unit using dual (ultrasonic and passive infrared) technology.
   3. Standards: Comply with UL 20.
   4. Rated 960 W at 20 A at 120 V for fluorescent or LED lighting, and 1/4 hp at 120 V ac.
   5. Adjustable time delay of 20 minutes.
   6. Able to be locked to Manual-On mode.
   7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux).
   8. Connections: Provisions for connection to BAS.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
B. Coordination with Other Trades:
   1. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   2. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   3. Install wiring devices after all wall preparation, including painting, is complete.
C. Device Installation:
   1. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
   2. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
D. Receptacle Orientation:
   1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
F. Dimmers:
   1. Install dimmers within terms of their listing.
   2. Verify that dimmers used for fan-speed control are listed for that application.
   3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device, listing conditions in the written instructions.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 FIELD QUALITY CONTROL

A. Tests for Receptacles:
   1. Line Voltage: Acceptable range is 105 to 132 V.
   2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
   3. Ground Impedance: Values of up to 2 ohms are acceptable.
   4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
   5. Using the test plug, verify that the device and its outlet box are securely mounted.
B. Wiring device will be considered defective if it does not pass tests and inspections.
C. Prepare test and inspection reports.

END OF SECTION 26 27 26

SECTION 26 28 13 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Cartridge fuses rated 600-V ac and less for use in enclosed switches.
   2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
   1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
      a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
      b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
   2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
   3. Current-limitation curves for fuses with current-limiting characteristics.
   4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
   5. Coordination charts and tables and related data.
   6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Ambient temperature adjustment information.
   2. Current-limitation curves for fuses with current-limiting characteristics.
   3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
   4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Comply with NEMA FU 1 for cartridge fuses.
D. Comply with NFPA 70.
E. Comply with UL 248-11 for plug fuses.

1.7 PROJECT CONDITIONS

A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.8 COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Cooper Bussmann, Inc.
   2. Edison Fuse, Inc.
   3. Ferraz Shawmut, Inc.
   4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE-FUSE CABINET

A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
   1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
   2. Finish: Gray, baked enamel.
   3. Identification: "SPARE FUSES" in 1-1/2-inch- (38-mm-) high letters on exterior of door.
   4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

A. Cartridge Fuses:
   1. Service Entrance: Class L, time delay.
   2. Feeders: Class L, time delay.

3.3 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.
C. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 26 28 13

SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Fusible switches.
   2. Nonfusible switches.
   3. Receptacle switches.
   4. Shunt trip switches.
   5. Molded-case circuit breakers (MCCBs).
   6. Molded-case switches.
   7. Enclosures.

1.3 DEFINITIONS

A. NC: Normally closed.
B. NO: Normally open.
C. SPDT: Single pole, double throw.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.5 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.
B. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
C. Field quality-control reports.
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
D. Manufacturer's field service report.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
   2. Fuse Pullers: Two for each size and type.

1.9 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
   2. Altitude: Not exceeding 6600 feet (2010 m).

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
   1. Notify Contracting officer no fewer than seven days in advance of proposed interruption of electric service.
   2. Indicate method of providing temporary electric service.
   3. Do not proceed with interruption of electric service without Contracting Officer’s written permission.
   4. Comply with NFPA 70E.

1.11 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.

4. Square D; a brand of Schneider Electric.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
   5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
   6. Hookstick Handle: Allows use of a hookstick to operate the handle.
   7. Lugs: Mechanical type, suitable for number, size, and conductor material.
   8. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   4. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
   5. Hookstick Handle: Allows use of a hookstick to operate the handle.
   6. Lugs: Mechanical type, suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

C. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

D. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

E. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

F. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
   1. Instantaneous trip.
   2. Long- and short-time pickup levels.
   3. Long- and short-time time adjustments.
   4. Ground-fault pickup level, time delay, and I^2t response.

G. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

H. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

I. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

J. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

K. Features and Accessories:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
   3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
   4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
D. Install fuses in fusible devices.
E. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Contracting Officer will engage a qualified testing agency to perform tests and inspections.
B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
C. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
D. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.
E. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Perform the following infrared scan tests and inspections and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
      b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
      c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

F. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

G. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 26 28 16

SECTION 26 29 23 - VARIABLE FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1 .1 SUMMARY

A. Section Includes:
   1. Variable frequency motor controllers for well pumps and motors.
   2. Variable frequency drives (VFD) for Wells 9 and 10 shall be furnished by Owner through Control Systems Technology (CST) and installed by Contractor. Installation shall include:
      a. Mounting VFDs
      b. Installing and connecting all power supply, and
      c. Installing additional conduit and communication cabling between the VFD and PLC cabinet; landing of control wires shall be completed by CST.
   3. Provided Equipment and Hardware (by CST) includes:
      a. VFD
      b. VFD Mounting Frame
      c. Harmonic Filter

B. Related Requirements:
   1. Section 26 05 00 – Common Work Results for Electrical
   2. Section 25 30 00 – Instrumentation and Control for Process Systems
   3. Section 25 51 00 – Integrated Automation Control for Facility Equipment
   4. Section 33 21 13 – Public Water Supply Wells

1 .2 REFERENCES

A. IEEE Standard 519—Line Disturbance Limitations

B. NFPA 70—National Electrical Code

C. NEMA ICS 3.1—Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems

D. NEMA 250—Enclosures for Electrical Equipment (1000 Volts Maximum)

E. UL 508C—Underwriter's Laboratory

1 .3 SYSTEM CONDITIONS

A. Project Location: Jackson, Wyoming, 6,120-ft elevation

B. VFDs installed in climate-controlled rooms within the Rangeview Well House

C. Temperature: Suitable for operation to 40 deg. C

D. Relative Humidity: Suitable for 0—95%, non-condensing

1 .4 SUBMITTALS

A. Provide submittals under provisions of Section 01 33 23

B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and over current protective devices, short circuit ratings, dimensions, and enclosure details

C. Coordination Certificate: Certify that the variable frequency controller supplier has reviewed the submittals of the proposed driven motors provided by others and has confirmed their suitability for control by the submitted variable frequency controllers

D. Harmonic Analysis Report: Indicate calculated line distortion and recommend drive or system modifications needed for IEEE 519 compliance. Provide VFD filters as noted on the plans.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product

F. Manufacturer's Field Reports: Submit under provisions of Section 01 33 23. Indicate start-up inspection findings

1 .5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 78 23.

B. Operation Data: Include instructions for starting and operating controllers, and describe operating limits that may result in hazardous or unsafe conditions

C. Maintenance Data: Include routine preventative maintenance schedule and list of recommended spare parts

1 .6 QUALITY ASSURANCE

A. Products specified in this Section to be coordinated and supplied by a single manufacturer or supplier

1 .7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70

B. The Manufacturer will furnish the product as listed and classified by Underwriter's Laboratories as suitable for the purpose specified and indicated

1 .8 COORDINATION

A. Coordinate with work of Divisions 26 and 46 for controllers installed in motor control center

B. Coordinate set up of operating parameters with pump supplier for each variable frequency controller

C. Coordinate with pump start-up and field testing to ensure that field representatives for pump supplier and variable frequency controller supplier are present.

1 .9 WARRANTY

A. Material and Workmanship: The VFD manufacturer shall warrant equipment supplied to be quality construction, free of defects in material and workmanship for a period of 3 (three) years. Warranties shall commence subsequent to start-up completed by a manufacturer's representative. Components failing to perform as specified, or as represented by the manufacturer, or as proven defective in service during the warranty periods, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the Owner.

B. Initial Effective Date: Warranty becomes effective on the date of VFD start-up.

PART 2 PRODUCTS

2 .1 MANUFACTURERS/MODEL

A. Rockwell Automation, Powerflex 753 AC Drive

B. or acceptable (by Owner) substitution.

2 .2 DESCRIPTION

A. Provide variable frequency controllers suitable for use with driven equipment as specified in the contract documents. Conform to requirements of NEMA ICS 3.1

B. Convert 460 volt, 3 phase, 60 Hertz input to an adjustable 3 phase output voltage and frequency using pulse width modulation

C. Ratings:
1. Rated Input Voltage: Self adjusting for input voltages from 460 VAC to 480 VAC, three phase, 60 Hertz $\pm$10%. Control logic shall be capable of riding through a power outage of up to 2 seconds in duration
2. Output Range: 0 to rated input voltage, 0 to 59.9 Hertz
3. Power: Preliminary assessment would require a 250A, 200 HP Drive. Contractor shall confirm upon bid final size. Power shall be as required by the driven equipment after applicable derating for temperature and altitude. Account for variable torque and constant torque loads as required by the driven equipment.
4. Displacement Power Factor: Between 1.0 and 0.98, lagging, over entire range of operating speed and load
5. Frequency Stability: +0.1 Hertz
6. Operating Ambient: 0 degrees C to 40 degrees C
7. Minimum Efficiency at Full Load: 98 percent

2 .3 DESIGN

A. Employ microprocessor-based inverter logic isolated from power circuits

B. Supply with AC Line Reactor in combination with a harmonic filter.

C. Design for ability to operate controller with motor disconnected from output

D. Designed for adjustable ramped start and stop operation

E. Design to attempt five automatic restarts following fault condition before locking out and requiring manual restart

F. Design for automatic restart after reset delay period on return of power supply after a power outage while running

2 .4 PRODUCT OPTIONS AND FEATURES

A. Safety Interlocks: Provide terminals for remote contact to inhibit starting under both manual and automatic mode and to immediately stop the VFC if running

B. Control Interface: Provide terminals for remote contact to allow starting and stopping in AUTO mode. Provide terminals for remote 4-20 mAdc signal to control speed of the VFC in AUTO mode

C. Manual speed control by keypad entry

D. Control Circuits: 115 V or less

E. Display:

F. Provide integral digital display to indicate output voltage, output frequency, and output current

G. Status Indicators: Separate indicators for overload, underload, instantaneous over current trip, over temperature, fault, input power ON, and RUN

H. Adjustments:

1. Volts Per Hertz Adjustment: Plus or minus 10 percent
2. Current Limit Adjustment: 0 - 150% percent of rated
3. Acceleration Rate Adjustment: 5 - 200 seconds to make a
4. 60 Hertz increase in speed
5. Deceleration Rate Adjustment: 5 - 200 seconds to make a
6. 60 Hertz decrease in speed
7. High Speed Limit Adjustment: 60 Hertz - drive limit
8. Low Speed Limit Adjustment: 50 Hertz
9. Input Signal: 4 - 20 Ma DC input signal to control speed in the automatic mode. Provide signal conditioner
10. Voltage Boost Adjustment: 0 - 200 volts
11. Voltage Boost Sync Adjustment:0 - 200 volts
12. Current Boost capabilities to meet starting VA requirements of the submersible motor
13. Frequency Lockout: Minimum of three (3) adjustable frequency settings with adjustable bandwidths to lockout operation at pump critical speeds (from pump manufacturer)
14. Start Frequency Adjustment: 2 - 20 Hertz
15. Minimum Operating Frequency Clamp: Adjustable 0 - 60 Hertz, set to prevent operation below the minimum pump speed needed for proper motor cooling
16. Maximum Operating Frequency Clamp: Adjustable 40 - 120 Hertz, set to prevent operation above maximum operating speed of pump

I. Alphanumeric diagnostic display with control pad:

1. Operating conditions including average output current, operating frequency, and analog input data
2. All fault conditions including overload, underload, over voltage, under voltage, over temperature, and phase reversal
3. All input operating parameters
4. Fault history, 4 event minimum

J. Keypad entry code, programmable to inhibit or enable critical microprocessor parameters from being accessed for read only or both read and entry

K. Manual reset on keypad to restore operation after abnormal system shutdown

L. Provide terminals for isolated output contacts:

M. Normally open for remote running indication

N. Normally open and normally closed drive fault contacts for remote alarm of any abnormal drive operation. Allow reversal of motor rotation via the drive control pad without disturbing wiring connections

2 .5 DRIVE PROTECTION

A. Input and output protection to sustain normal power system transients without damage to drive

B. Monitor peak current at output and provide instantaneous over current trip under adverse starting or running conditions

C. Power circuit components protected against damage from power outage, over voltage, under voltage, ground fault or

D. Provide phase short circuit of VFC output terminals, phase loss, phase unbalance, phase reversal and drive overtemperature

E. Current limit control and overload trip

F. Pump protection: Underload shutdown to shut down drive as quickly as possible without going through the normal ramp down procedure upon sensing a preset, adjustable low amperage setting

2 .6 FABRICATION

A. Wiring Terminations: Match conductor materials and sizes indicated

2 .7 SOURCE QUALITY CONTROL

A. Inspect and production-tests:
1. Incoming components and materials
2. Power semiconductors
3. Test SCR's, diodes, and transistors to ensure correct function and highest reliability
4. Integrated circuit lots
5. Functional tests on active components

6. Functional tests on electronic cards and a "burn-in" (minimum 20 hours, maximum temperature 55 degree C) on the main cards
7. Two-part tests on inverter units. Run at maximum switching frequency for 6 hours and with motor load for 20-30 minutes
8. Test assembled controller connected to a motor
   a. Operate the drive and motor over a representative range of speeds and mechanical loads
   b. Monitor all relevant drive and motor characteristics including; temperature, currents, voltages, power factor, vibration and noise levels
9. Keep and inspection record of all tests
10. Indicate how closely the VFC design and installation complies with IEEE-519-1981 guidelines for total harmonic distortion, notch depth, and notch area
11. The point of common coupling shall be at the primary terminal of the utility transformer. The study shall calculate the voltage and current harmonic distortion at the secondary terminals of the utility transformer
12. Input power system data:
    a. Utility Transformer: 1000 kVA, X = 5%, 7200 V to 277/480 V wye grounded
    b. Primary short circuit amps: Infinite bus
    c. Utility transformer within 150 feet of the VFC
13. After installation is complete measure the voltage harmonic distortion and the current harmonic on all phases at the secondary terminal of the service transformer and at the load side of the service disconnect. Detail findings in a report

PART 3 EXECUTION

3 .1 INSTALLATION

A. Install controller where indicated, in accordance with manufacturer's written instructions, NEMA ICS 3.1, NEMA 12, w/o air filters, and meeting UL 845 (heat rise)

B. Tighten accessible connections and mechanical fasteners after placing controller

C. Install fuses in fusible switches

D. Provide engraved plastic nameplates under the provisions of Section 40 05 53. Provide neatly typed label inside motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

E. Comply with automatic control requirement included in Section 25 51 00.

3 .2 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed by Supplier under provisions of Section 01 40 00 – Quality Requirements.
B. Inspect completed installation by Others for physical damage, proper alignment, anchorage, and grounding

3 .3 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems under provisions of Sections 01 73 40 & 01 91 14.

B. Set up:
   1. Provide programming of operating parameters. Obtain performance requirements from pump manufacturers and Engineer
   2. Provide minimum of four (4) separate trips to site to work with pump suppliers' field representatives during pump start-up and testing

3 .4 ADJUSTING

A. Supplier to adjust work under provisions of Section 01 73 40 – Execution

B. Make final adjustments to installed drive to assure proper operation.

3 .5 SPARE PARTS

A. Provide the following spare parts under provisions of 01 67 00 – Product Requirements.
   1. One main board of each type used per schedule
   2. One operators panel at each type used per schedule
   3. One each inverter module of each type used per schedule
   4. One each of all require control fuses and three each of power fuses for each size of drive furnished

3 .6 DEMONSTRATION & TRAINING

A. Demonstration:
   1. Supplier to provide systems demonstration under provisions of Section 01 91 14 – Commissioning.
   2. Demonstrate operation of controllers in automatic and manual mode.

B. Training:
   1. Perform under provisions of Sections 01 79 00 and 01 91 14
   2. Manufacturer, or his representative, shall provide a minimum of four (4) hours of training for Owner's operating personnel. Schedule with Engineer a minimum of 14 days prior. Adjust schedule to accommodate Owners staff.

END OF SECTION 26 29 23

SECTION 26 32 13 - ENGINE GENERATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged engine-generator sets for standby power supply with the following features:

1. Diesel engine.
2. Unit-mounted cooling system.
3. Unit-mounted control and monitoring.

B. Related Sections include the following:

1. Division 25 – Integrated Automation
2. Division 26 – Electrical

1.3 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:

1. Thermal damage curve for generator.
2. Time-current characteristic curves for generator protective device.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
2. Design Calculations: Signed and sealed by a qualified professional engineer. Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
3. Vibration Isolation Base Details: Signed and sealed by a qualified professional engineer. Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include base weights.
4. Wiring Diagrams: Power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that day tank, engine-generator set, batteries, battery racks, accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source quality-control test reports.

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance with applicable regulations.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

C. Field quality-control test reports.

D. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fuses: One for every 10 of each type and rating, but no fewer than one of each.
2. Indicator Lamps: Two for every six of each type used, but no fewer than two of each.
3. Filters: One set each of lubricating oil, fuel, and combustion-air filters.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than four hours' normal travel time from Installer's place of business to Project site.
2. Engineering Responsibility: Preparation of data for vibration isolators and seismic restraints of engine skid mounts, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 200 miles (321 km) of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL), and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

2. Contractor shall fill the generator diesel storage tank to the “full” level prior to testing. Delivery and fuel costs shall be borne by Contractor.

D. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

F. Comply with ASME B15.1.

G. Comply with NFPA 37.

H. Comply with NFPA 70.

I. Comply with NFPA 99.

J. Comply with NFPA 110 requirements for Level 1emergency power supply system.

K. Comply with UL 2200.

L. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

M. Noise Emission: Comply with applicable state and local government requirements

1.9 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: Minus 40 to plus 100 deg F.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 6150 feet.

1.10 COORDINATION

A. Coordinate size and location of concrete bases for package engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 2-years from date of Substantial Completion.

1.12 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 24 months' full maintenance by skilled employees of manufacturer's designated service organization. Include quarterly exercising to check for proper starting, load transfer, and running under load. Include routine preventive maintenance as recommended by manufacturer and adjusting as required for proper operation. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide Cummins Model DFEK, or approved equal.

2.2 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set, **G-110**

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

C. Capacities and Characteristics:

1. Power Output Ratings: 500kW Nominal ratings as indicated.
2. Output Connections: 480V, Three-phase, four wire.
3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component.

D. Generator-Set Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.

7. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time: Comply with NFPA 110, Type 10, system requirements.

E. Generator-Set Performance for Sensitive Loads:

1. Oversizing generator compared with the rated power output of the engine is permissible to meet specified performance.

    a. Nameplate Data for Oversized Generator: Show ratings required by the Contract Documents rather than ratings that would normally be applied to generator size installed.

2. Steady-State Voltage Operational Bandwidth: 1 percent of rated output voltage from no load to full load.
3. Transient Voltage Performance: Not more than 10 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 0.5 second.
4. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.
5. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
6. Transient Frequency Performance: Less than 2-Hz variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within three seconds.
7. Output Waveform: At no load, harmonic content measured line to neutral shall not exceed 2 percent total with no slot ripple. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
8. Sustained Short-Circuit Current: For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or other generator system components.
9. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

    a. Provide permanent magnet excitation for power source to voltage regulator.

10. Start Time: Comply with NFPA 110, Type 10, system requirements.

2.3 ENGINE

A. Fuel: Fuel oil, Grade DF-2.

B. Rated Engine Speed: 1800 rpm.

C. Maximum Piston Speed for Four-Cycle Engines: 1995 fpm

D. Lubrication System: The following items are mounted on engine or skid:

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

E. Engine Fuel System:

1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.
2. Relief-Bypass Valve: Automatically regulates pressure in fuel line and returns excess fuel to source.

F. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity.

G. Governor: Adjustable isochronous, with speed sensing.

H. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

    a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and noncollapsible under vacuum.
    b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

I. Muffler/Silencer: Critical grade puck-type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 37 dB at 500 Hz.
2. Manufacturer: Innovative Exhaust Solution, Inc. 701C Series, Style 3, or approved equal.
3. Insulation: Firwin heavy-duty silicon removable insulation blankets with stainless steel lacing wire, or approved equal.
4. Roof Thimble & Exhaust Accessories: Stainless NFPA custom roof thimble by

Innovative Exhaust Solutions Inc with roof flanges, rain guard and circle clamp, and flap-style exhaust ran cap, or approved equal.

J. Air-Intake Filter: Heavy-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

K. Starting System: 24-V electric, with negative ground.

1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: 60 seconds.
4. Battery: Adequate capacity within ambient temperature range specified in Part 1 "Project Conditions" Article to provide specified cranking cycle at least three times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater shall be arranged to maintain battery above 10 deg C regardless of external ambient temperature within range specified in Part 1 "Project Conditions" Article. Include accessories required to support and fasten batteries in place.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.4 FUEL/OIL STORAGE

A. Comply with NFPA 30.

B. Remote Deisel Fuel Day Tank (**DT-110**): Factory installed and piped, complying with UL 142 fuel oil tank. Features include the following:
   1. Capacity: 560 gallons (min.)
   2. Manufacturer: PRYCO double wall tank, Model PY700DW complete with:
      a. **LS-110**: Tank level sensor/indicator/fuel gauge. Analog output for %full tank per Section 25 51 00.
      b. Heavy duty float switch,
      c. Fuel pump and motor, size for 500 KW generator at max. load. Motor (1/3 HP+, 120VAC) is thermally protected and pump is has bronze gears with stainless steel shafts.
      d. Threaded connections for engine supply and return.
      e. Atmospheric vent.
      f. Pump to tank inlets and outlets.
      g. Overflow
      h. Tank drain.
      i. Two (2) extra threaded ports.
      j. U/L listed tank with emergency vent; sized appropriately for tank size and vented to the exterior of the building.
      k. Provide PRYCO Model 230 exterior (remote) Fill Station (FS-110), compatible system with day tank, including:
         i. Lockable enclosure
         ii. NEMA R3 panel with separate compartments for the control panel and fueling connection.
         iii. 2-inch Cam-and-Groove Connector
         iv. Level indicator control panel with alarms
         v. High level solenoid shutoff
         vi. 7.5 –gal. spill containment sump
         vii. Lockable drain port.
         viii. Analog tank level sensor; compatible with tank, may be a substitute for LS-110 if compatible with Well House SCADA system described in Section 25 51 00.
         ix. and fueling compartment.
   3. Containment Provisions: Comply with requirements of authorities having jurisdiction.

2.5 CONTROL AND MONITORING

A. **ATS-110**: Automatic Transfer Switch
   1. ATS mfg shall be the same as the genset.
   2. Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode- selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a remote emergency-stop switch also shuts down generator set.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of a

remote emergency-stop switch also shuts down generator set.

C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the generator set. Mounting method shall isolate the control panel from generator-set vibration.

D. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common wall-mounted control and monitoring panel.

E. Configuration: Operating and safety indications, protective devices, basic system controls, engine gages, instrument transformers, generator disconnect switch or circuit breaker, and other indicated components shall be grouped in a combination control and power panel. Control and monitoring section of panel shall be isolated from power sections by steel barriers. Panel features shall include the following:

1. Wall-Mounting Cabinet Construction: Rigid, self-supporting steel unit complying with NEMA ICS 6. Power bus shall be copper. Bus, bus supports, control wiring, and temperature rise shall comply with UL 891.
2. Switchboard Construction: Freestanding unit complying with Division 26 Section "Switchboards."
3. Switchgear Construction: Freestanding unit complying with Division 26 Section "Low-Voltage Switchgear."
4. Current and Potential Transformers: Instrument accuracy class.

F. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1system, and the following:

1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage.
6. Engine lubricating-oil pressure gage.
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Fuel tank derangement alarm.
11. Fuel tank high-level shutdown of fuel supply alarm.
12. Generator overload.

G. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

H. Connection to Data Link: A separate terminal block, factory wired to Form C dry contacts, for each alarm and status indication is reserved for connections for data-link transmission of indications to remote data terminals. Data system connections to terminals are covered in Division 26 Section "Electrical Power Monitoring and Control."

I. Common Remote Audible Alarm: Comply with NFPA 110 requirements for Level 1 systems. Include necessary contacts and terminals in control and monitoring panel.

1. Overcrank shutdown.
2. Coolant low-temperature alarm.
3. Control switch not in auto position.
4. Battery-charger malfunction alarm.
5. Battery low-voltage alarm.

J. Common Remote Audible Alarm: Signal the occurrence of any events listed below without differentiating between event types. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset.

1. Engine high-temperature shutdown.
2. Lube-oil, low-pressure shutdown.
3. Overspeed shutdown.
4. Remote emergency-stop shutdown.
5. Engine high-temperature prealarm.
6. Lube-oil, low-pressure prealarm.
7. Fuel tank, low-fuel level.
8. Low coolant level.

K. Remote Emergency-Stop Switch: wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.6 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated

voltage to avoid overshoot.

C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.7 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H or Class F.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

H. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified.

1. Adjusting rheostat on control and monitoring panel shall provide plus or minus 5 percent adjustment of output-voltage operating band.

I. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

K. Subtransient Reactance: 12percent, maximum.

L. al connection.

2.8 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.

1. Material: [Standard neoprene] [Natural rubber] [Bridge-bearing neoprene, complying with AASHTO M 251].
2. Durometer Rating: [30] [40] [45] [50] [60] [65] [70] <Insert number>.
3. Number of Layers: [One] [Two] [Three] [Four] <Insert number>.

B. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

2.10 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with NFPA 110, Level 1 Energy Converters and with IEEE 115.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Full load run.
3. Maximum power.
4. Voltage regulation.
5. Transient and steady-state governing.
6. Single-step load pickup.
7. Safety shutdown.
8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
9. Report factory test results within 10 days of completion of test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

C. Install packaged engine generator with elastomeric isolator pads having a minimum deflection of 1-inch high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at roof. Piping shall be same diameter as muffler outlet. Flexible connectors and steel piping materials and installation requirements are specified in Division 23 Section "Hydronic Piping."

1. Install condensate drain piping to muffler drain outlet full size of drain connection with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe with welded joints. Flexible connectors and piping materials and installation requirements are specified in Division 23 Section "Hydronic Piping."

E. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Division 23 Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

C. Connect engine exhaust pipe to engine with flexible connector.

D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 IDENTIFICATION

A. Identify system components according to Division 23 Section "Identification for HVAC Piping and Equipment" and Division 26 Section "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.
4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg. Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
7. Exhaust Emissions Test: Comply with applicable government test criteria.
8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.

E. Coordinate tests with tests for transfer switches and run them concurrently.

F. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records

available for examination on request.

G. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

H. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

I. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

J. Remove and replace malfunctioning units and [retest] [reinspect] as specified above.

K. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

L. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

M. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 26 32 13

SECTION 26 51 00 - BUILDING LIGHTING

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Section 26 05 37 - Boxes.
B. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

1.2 REFERENCE STANDARDS

A. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 10th Edition.
B. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
C. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.
D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
E. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
F. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
G. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements. I. NFPA 101 - Life Safety Code; 2015.
I. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
J. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
K. UL 1598 - Luminaires; Current Edition, Including All Revisions.
L. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
   2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
   4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IESNA LM-63 standard format upon request.
   3. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

D. Certificates for Dimming Drivers: Manufacturer's documentation of compatibility with dimming controls to be installed.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

H. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Provide five-year minimum manufacturer warranty for all LED luminaires, including drivers.

C. Provide five-year minimum pro-rata warranty for batteries for emergency lighting units.

D. Provide ten-year minimum pro-rata warranty for batteries for self-powered exit signs.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
G. Recessed Luminaires:
1. Ceiling Compatibility: Comply with NEMA LE 4.
2. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
H. Hazardous (Classified) Location Luminaires: Listed and labeled as complying with UL 844 for the classification of the installed location.
I. LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
J. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
1. LED Tape - General Requirements:
a. Listed.
b. Designed for field cutting in accordance with listing.
K. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.

2.3 EMERGENCY LIGHTING UNITS
A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
C. Battery:
1. Size battery to supply all connected lamps, including emergency remote heads where indicated. Battery to run all connected lamps for the minimum time stated above in 2.3(B).
D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.4 EXIT SIGNS
A. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
1. Number of Faces: Single or double as indicated or as required for the installed location.
2. Directional Arrows: As indicated or as required for the installed location.

2.5 BALLASTS AND DRIVERS
A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts/drivers complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:
1. Dimming Range: Continuous dimming from 100 percent to ten percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70. C. Verify that suitable support frames are installed where required.
D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 2605 37as required for installation of luminaires provided under this section.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install products in accordance with manufacturer's instructions.
D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
E. Install luminaires plumb and square and aligned with building lines, with adjacent luminaires, and in coordination with both architectural and electrical plans.
F. Suspended Ceiling Mounted Luminaires:
1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
3. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
4. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. Recessed Luminaires:
1. Install trims tight to mounting surface with no visible light leakage.
2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing. H. Suspended Luminaires:

H. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
J. Install accessories furnished with each luminaire.

K. Bond products and metal accessories to branch circuit equipment grounding conductor.
L. Emergency Lighting Units:
1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls. M. Exit Signs:
M. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
N. Remote Ballasts: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire. O. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL
A. See Section 01 40 00 - Quality Requirements, for additional requirements.
B. Inspect each product for damage and defects.
C. Operate each luminaire after installation and connection to verify proper operation.
D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING
A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.6 CLEANING
A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES
A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
D. Just prior to Substantial Completion, replace all lamps that have failed.

END OF SECTION 26 51 00

SECTION 31 05 13 - SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Subsoil materials.
   2. Topsoil materials.

B. Related Sections:
   1. Section 01 11 00 – Summary of Work,
   2. Section 31 05 16 – Aggregates for Earthwork.
   3. Section 31 10 00 – Site Clearing
   4. Section 31 23 17 – Trenching.
   5. Section 31 23 23 – Fill.
   6. Section 32 91 19.13 – Topsoil Placement and Grading.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Samples:
   1. Submit 5-gallon bucket samples of each type of subsoil fill to a testing laboratory. Complete laboratory testing on fill materials in accordance with PART 3.7, Section 31 23 23 – Fill.
   2. When requested, submit samples of materials to the Engineer.

C. Materials Source: Submit name of imported materials source.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements**.**

E. Weed-free certification for imported materials.

1.5 QUALITY ASSURANCE

A. Furnish each subsoil materials from single source throughout the Work.

B. Perform Work in accordance with authorities having jurisdiction.

C. All imported materials shall be certified weed free.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

A. Contractor shall maximize the use excavated onsite soils.

B. Subsoil Type A: Trench Fill as specified in Section 31 23 17 – Trenching.

C. Subsoil Type B: Trench Fill Under Roadways as specified in Section 31 23 17 – Trenching.

D. Subsoil Type S1: Select Fill
   1. Excavated material for re-use during backfill operations of existing and new structures.
   2. Graded.
   3. Native soils free of lumps and rocks greater than 12 inches, organic debris and foreign matter.

E. Subsoil Type S2: Landscaping Fill
   1. Excavated material for re-use during backfill operations.
   2. Graded.
   3. Native soils free of lumps greater than 12 inches and rocks larger than 48 inches, organic debris and foreign matter.

F. Topsoil Type S3: Native Topsoil
   1. Excavated and reused material, unless otherwise required to waste.
   2. Graded.
   3. Free of roots, rocks larger than 3 inch, roots larger than 3 inch, subsoil, large weeds and foreign matter.
      a. Screening: Single screened.

G. Topsoil Type S4: Imported Topsoil
   1. If native topsoil is inadequate in quantity or quality, or both, obtain additional topsoil from an approved location. No additional compensation will be made for topsoil procured by Contractor.
   2. Imported topsoil shall consist of natural or cultivated surface-soil layer containing organic matter and sand, silt and clay particles; friable, pervious and black or a darker shade of

brown, gray or red than underlying subsoil; reasonably free of subsoil and weeds, roots, toxic materials or other non-soil materials.

H. Topsoil Type S5: Embankment Material
   1. All embankment material shall be approved before use and be free from cinders, ashes, ice, frozen material, debris, muck, detrimental quantities of organic materials, and other unsuitable materials.
   2. If moisture content or material characteristics are not conducive to proper compaction and installation of the embankment during construction, the Engineer may disapprove further use of the fill material.

2.2 SOURCE QUALITY CONTROL

A. Contractor shall obtain imported subsoil or topsoil materials from a source approved by the Engineer.

B. Submit samples of imported materials when requested by Engineer.

C. Section 01 40 00 - Quality Requirements**:** Testing and Inspection Services.

D. Testing and Analysis of Insitu and Imported Subsoil Material: Perform in accordance with ASTM D698.

E. When tests indicate materials do not meet specified requirements, change material and retest.

F. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

A. Excavate subsoil and topsoil from areas designated. Strip topsoil to a minimum depth of 3-inches and maximum depth of 24-inches in areas subject to disturbance. Comply with Section 31 10 00 – Site Clearing.

B. Legally remove and dispose of excess excavated subsoil, not intended for reuse, offsite.

C. Legally remove and dispose of excavated materials not meeting requirements for use as native backfill and topsoil materials from site.

3.2 STOCKPILING

A. Stockpile excavated native materials.
   1. Topsoil: Comply with Section 31 10 00 – Site Clearing for stripping, stockpiling and reclamation.
      a. Stockpile topsoil to a maximum height of 6 vertical feet.
   2. Subsoil:

a. Stockpile excavated topsoil and subsoil intended for reuse onsite at a location approved by Owner/Engineer.
b. Buried Utility Installation: Place native trench cuttings used for backfill adjacent to the utility trench.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers, or stockpile apart to prevent intermixing of soil types, or contamination.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. Reclaim areas in accordance with Section 32 91 19.13 – Topsoil Placement and Grading.

END OF SECTION 31 05 13

SECTION 31 05 16 - AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Aggregate for Drains
   2. Imported and Reclaimed Aggregate Base Course
   3. Pit Run Aggregate (Structural Fill)
   4. Cobble Rock
   5. Granular Fill
   6. Aggregate for Pervious Backfill Material
   7. Aggregate for Riprap
   8. Type 1 Pipe Bedding Material
   9. Type 2 Pipe Bedding Material

B. Related Sections:
   1. Section 31 05 13 - Soils for Earthwork: Fill and grading materials.
   2. Section 31 23 17 - Trenching.
   3. Section 31 23 23 - Fill.
   4. Section 33 05 13 – Manholes and Structures
   5. Section 33 11 13 - Public Water Utility Distribution Piping

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses.
   2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
   2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
   4. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
   5. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Aggregate source information including weed free certification.

C. Product Data: Submit data on all materials specified herein.
   1. Aggregates for Drainage -Submit lab analysis and tests under ASTM C136 as required to assure material meets requirements specified below.
   2. Type 1 Pipe Bedding Material: If imported, submit lab analysis and tests under ASTM D-2487 as required to assure material meets USCS soil classification requirements specified below.
   3. Type 2 Pipe Bedding Material: If imported, submit lab performed gradation analysis.
   4. Imported Aggregate Base Course: Submit lab performed gradation analysis and moisture density relationship curve utilizing ASTM D698 (Standard Proctor).
   5. Granular Fill: Submit lab analysis and tests under ASTM C136 as required to assure material meets requirements specified below.
   6. At the discretion of the Engineer observed variability in imported materials from previously submitted product data will result in additional testing at the Contractor's expense.

D. When requested, submit samples of materials to the Engineer.

1.5 QUALITY ASSURANCE

A. If aggregate is imported, furnish all aggregate material from a single source throughout the Work.

B. If Type 1 and/or Type 2 Pipe Bedding is to be processed from native onsite material, provide periodic lab analysis and tests under ASTM D-2487 as required to assure material meets USCS soil classification requirements specified below. Frequency of periodic laboratory analysis shall be at the discretion of the Engineer. Laboratory testing costs shall be paid by the Contractor.

PART 2 PRODUCTS

2.1 DEFINITIONS

A. Coarse Aggregate: Materials retained on a No. 4 sieve.

B. Fine Aggregate: Materials passing a No. 4 sieve.

C. Gradation Requirements: Based on percentage of material by weight passing laboratory sieves having square openings.

2.2 SOURCE QUALITY CONTROL

A. Imported Aggregates: Aggregates shall come from a weed free source approved by the Engineer, or be sterilized through a heating process.
   1. Upon delivery of imported materials, Contractor shall furnish weigh tickets with the aggregate source information and weed-free certification.

B. Comply with Section 01 40 00 - Quality Requirements for testing and inspection services.

C. When tests indicate materials do not meet specified requirements, change material and retest.

2.3 AGGREGATE FOR DRAINS

A. Gravel for drains shall be crushed or natural sand and gravel or other approved free-draining material. The material shall be uniformly graded from coarse to fine within the following gradation requirements for the material type indicated. Where the grading is not indicated, Grading A shall be used.

Sieve	% by Weight Passing		
Designation	Grading A	Grading B	Grading C
2”	100	---	---
1 1/2"	95 – 100	100	---
1”	---	95 – 100	---
3/4"	35 – 75	---	100
3/8”	10 – 30	---	95 – 100
#4	0 – 5	0 – 10	---
#8	---	---	65 – 95
#16	---	---	5 – 30
#100	---	---	0 – 10

2.4 IMPORTED AND RECLAIMED AGGREGATE BASE COURSE

A. Imported Aggregate Base Course for Roads: Grading H or W in accordance with requirements below.
   1. The composite materials shall be free from clay balls, vegetable matter, and other deleterious substances, and shall not contain an excess of thin or elongated pieces.
   2. Crushed sub-base and crushed base shall be crushed stone or crushed gravel and an approved soil binder or natural filler, where required, conforming to the following requirements:
      a. Coarse aggregate shall consist of hard, durable particles or fragments of stone or gravel. Materials that break up when alternately frozen and thawed or wetted and dried shall not be used. Unless otherwise specified, the coarse aggregate shall have a percentage of wear of not more than 50.
      b. Fine aggregate shall consist of crushed stone, crushed gravel, or natural sand. The fraction passing the #200 sieve shall not be greater than two-thirds of the fraction passing the #40 sieve. The fraction passing the #40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6 except that, when the plasticity index is nonplastic (NP), the liquid limit shall not be more than 30.
      c. Crushed base and crushed sub-base shall meet one of the following gradation requirements:

Sieve Designation	Grading D	Grading G	Grading H	Grading J	Grading K	Grading W
2”	100	100	---	100	---	---
1 1/2"	95 – 100	95 – 100	---	95 – 100	100	100
1”	---	---	100	---	95 – 100	95 – 100

3/4"	---	---	95 – 100	---	---	---
#4	50 – 85	---	45 – 65	35 – 75	40 – 65	46 – 65
#8	40 – 70	---	33 – 53	---	30 – 55	33 – 53
#200	2 – 15	0 – 15	3 – 12	0 – 15	3 – 15	3 – 12

B. Comply with requirements of Section 31 10 00 – Site Clearing, for reuse of milled asphalt (reclaimed aggregate base course) in paved areas.

2.5 PIT RUN AGGREGATE

A. Well-graded sand, sandy gravel, gravel, or fine cobble used for Structural Fill.

B. Maximum plasticity index of a 6 as determined by AASHTO Designations T-89 and T-90.

2.6 COBBLE ROCK

A. Random sized, smooth, round aggregate.

B. 6 to 12-inches-diameter.

2.7 GRANULAR FILL

A. Natural gravel, crushed stone, or sand meeting the following gradation requirements as determined by ASTM D422-63(1998):

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
3-inch	100
No. 8	10

2.8 AGGREGATE FOR PERVIOUS BACKFILL MATERIAL

A. Pervious Backfill Material shall consist of gravel, crushed gravel, crushed rock, natural sands, manufactured sands, or combinations thereof, and shall meet the following gradation requirements:

Sieve Designation	% by Weight Passing
2"	100
#4	0 – 50
#40	0 – 30
#100	0 – 10
#200	0 – 4

B. The fraction passing the #40 sieve shall be non-plastic (NP) and shall have a liquid limit not greater than 30.

2.9 AGGREGATE FOR RIPRAP

A. Aggregate for riprap shall be hard, durable, crushed, quarried, or natural stone, or broken concrete having an apparent specific gravity of 2.4 or greater. The absorption shall not exceed 4% unless

otherwise approved by Engineer in the Special Provisions. The stone shall be free of weak laminations and cleavages, and shall be of a quality that will not disintegrate on exposure to water or weathering. The aggregate for the various types of riprap shall meet the following additional requirements:

1. Class l Riprap aggregate shall consist of two sizes of stone.
   a. Primary stones shall be not less than 3" thick and shall weigh not less than 50 pounds. At least 60 percent of the stones shall weigh more than 80 pounds each.
   b. Choke stones shall be fragments or spalls of the proper size to satisfactorily wedge between the primary stones as placed.
2. Class 2 Riprap aggregate shall be graded with a sufficient amount of smaller stones uniformly distributed throughout. At least 60 percent of the stones shall weigh more than 80 pounds each.
3. Grouted Riprap aggregate shall conform to the specifications for Class 1 or Class 2 Riprap. If not specified, Class 1 Riprap shall be used.
4. Wire Enclosed Riprap aggregate shall be round or angular stones. Not less than 95% of the stone shall be retained on a screen or wire having 2" square openings.
5. Sacked Concrete Riprap aggregate shall consist of either a sandy or gravelly pit-run material. This material shall be clean and free from roots, vegetable matter, or other deleterious substances. The aggregate shall meet the following gradation requirements:

Sieve Designation	% by Weight Passing
2"	80 – 100
#200	0 – 4

B. Aggregate Filler for Riprap: Filter aggregates for riprap shall be hard, durable particles or fragments of crushed stone or natural gravel, screened or crushed to meet the following gradation requirements:

Sieve Designation	% by Weight Passing
3"	100
#4	20 – 50
#200	0 – 10

2.10 TYPE 1 PIPE BEDDING MATERIAL

A. Bedding material around pipes shall extend six (6) inches under the pipe to twelve (12) inches over the pipe and consist of select coarse-grained soils with a maximum particle size of 3/4” or less. Pipe bedding shall meet Unified Soil Classifications GW, GW-GM, GP, GP-GM, SW,SP, or SM, or as specifically approved by the Engineer. Bedding material shall be free from clods or frozen material, and when installed/compacted shall be within ±2% of optimum moisture content as determined by ASTM D698. Contractor may be required to sort or screen trench cutting material or procure adequate native pipe bedding material from areas of open trench elsewhere throughout the project, or import satisfactory material from offsite.

2.11 TYPE 2 PIPE BEDDING MATERIAL

A. Type 2 Pipe Bedding Material-granular 1½” - 6” diameter granular aggregate as required for foundation in over-excavated trenches from 6” under the pipe and down.

2.12 PAVER BACKFILL MATERIALS

A. Bedding Course: ASTM No. 8 or No. 9.

Sieve Designation	% by Weight Passing (No. 8)	% by Weight Passing (No. 9)
1/2"	100	-
3/8”	85 - 100	100
#4	10 – 30	85 – 100
#8	0 – 10	10 – 40
#16	0 – 5	0 – 10
#50	-	0 – 5

B. Open Graded Base: Astm No. 57.

Sieve Designation	% by Weight Passing (No. 57)
1½"	100
1”	95 - 100
¾”	-
½”	25-60
3/8”	
#4	0 - 10
#8	0 - 5

C. Stone Subbase: ASTM No. 2

Sieve Designation	% by Weight Passing (No. 57)
3”	100
2½”	90 - 100
2”	35-70
1½”	0 - 15
1”	-
¾”	0 - 5

PART 3 EXECUTION

3.1 STOCKPILING EXCAVATED AGGREGATE

A. Stockpile excavated material meeting requirements of PART 2, above, that are intended for reuse.

B. Remove excess excavated materials not intended for reuse, from site.

3.2 STOCKPILING

A. Stockpile materials on site at staging areas designated in the drawings, or other areas approved by the Engineer.

B. Sites for aggregate stockpiles shall be grubbed, stripped of topsoil and cleaned prior to storing aggregates, and the site shall be firm and smooth and well drained. A bed of aggregate suitable to avoid the inclusion of soil or foreign material shall be maintained.

C. Stockpile in sufficient quantities to meet Project schedule and requirements.

D. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.

E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

F. The aggregates shall meet applicable parts of this section for the type of material required.

G. The stockpiles shall be built in layers not exceeding four feet in height, and each layer shall be completely in place before the next layer is started so as to prevent segregation. The material shall be deposited in such manner as to prevent coning, except in the case of fine aggregate composed of material approximately 90% finer than a #4 sieve.

H. Dumping, casting, or pushing over sides of stockpiles is prohibited except in the case of fine aggregate materials.

I. Any stockpiling of materials derived by wet pit or dredging operations, other than those stockpiles previously mentioned, are subject to prior approval of the Engineer and must be specified and submitted in the Contractor's plan of operations.

J. When it is necessary to operate trucks or other equipment on the stockpile in the process of building that stockpile, it should be done in a manner approved by Engineer. Any method of stockpiling aggregate which allows the stockpile to become contaminated with foreign matter or causes excessive degradation of the aggregate will not be permitted. Excessive degradation will be determined by sieve tests of samples taken from any portion of the stockpile over which equipment has operated. Failure of such samples to meet all grading requirements for the aggregate shall be considered cause for discontinuance of such stockpiling procedures.

K. The aggregate shall be transferred from the stockpiles in such a way as to obtain a material having a uniform grading.

3.3 PROTECTION FOR AGGREGATE

A. The equipment and methods utilized in the production, storage, transportation and final placement of aggregate materials shall be such as to provide in-place materials meeting all requirements as specified.

3.4 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION 31 05 16

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Protecting existing landscaping including trees, shrubs, groundcovers, plants, grass, and other vegetation described in the contract documents and by the Engineer during pre-construction conference.
   2. Removing existing trees, shrubs, groundcovers, plants, grass, and other vegetation.
   3. Clearing and grubbing.
   4. Stripping and stockpiling topsoil.
   5. Removing above and below-grade site improvements.
   6. Removal, disposal and/or reuse of existing concrete and asphalt surfacing.
   7. Removing existing fill.

B. Related Sections:
   1. Section 31 05 13 – Soils for Earthwork.
   2. Section 33 11 13 - Public Water Utility Distribution Piping

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 3 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

   1. In areas where insitu soils do not appear to meet the definition above, the Contractor shall treat the top 4 to 6 inches of material as topsoil and strip it according to this specification.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to be stockpiled, or to remain on project site, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing. Comply with Section 01 32 33 – Photographic Documentation.

B. Record drawings identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions. Additional requirements for project record documents are included in Section 01 77 00 – Closeout Procedures.

1.6 QUALITY ASSURANCE

A. Preconstruction Conference: Conduct conference at Project site as directed by Engineer prior to start of construction. Contractor shall comply with requirements of Section 01 31 00 – Project Management and Coordination.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations. Comply with Section 01 55 26 – Traffic Control.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Engineer and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction (AHJ's).

B. Protect improvements on Owner's property.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises in approved location.

D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. Comply with Section 01 73 40 – Execution, for locating buried utilities.

E. Unless otherwise stated, <u>do not</u> commence site clearing operations until temporary erosion and sedimentation control measures are in place.

F. Restore damaged improvements to their original condition, as acceptable to Engineer.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: As specified in Section 31 05 13 – Soils for Earthwork.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks, survey control points, monuments, property line pins and other reference points from disturbance during construction. If disturbed or destroyed, restore or replace at no cost to Owner.

B. Prior to construction activities, Contractor shall clearly mark the limit of disturbance boundary with highly visible orange plastic fencing and steel posts and/or chain link fencing as required. The location of the marked boundary shall be approved by the Engineer.
   1. Impacts to vegetation, shrubs and trees shall be limited to areas that lie within the construction corridor (limits of disturbance). Do not operate equipment or disturb areas outside the "limits of disturbance" without prior written approval from the Engineer/Owner.
   2. Prior to clearing and grubbing activities, mark trees exceeding 4-inch dbh that are within the construction corridor. Contractor shall coordinate the removal of marked trees with the Engineer, or representative thereof. When feasible, Engineer may request Contractor to protect certain trees, and may provide Contractor additional space in order to do so.

C. Provide erosion control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust from leaving project site. Use erosion control best management practices to minimize soil erosion.

D. Locate and clearly flag trees and vegetation to remain or to be relocated.

E. Protect existing site improvements to remain from damage during construction.
   1. Restore or replace damaged improvements to their original condition, as acceptable to the Owner.

3.2 TREE PROTECTION

A. Unless authorized by the Engineer, do not remove trees outside fill or excavated areas exceeding 4 dbh in size.

B. Protect trees left standing from permanent damage by construction operation.

C. Trim standing trees as directed by the Engineer.

D. With approval and coordination of the Engineer, cut dead snags that may be outside the construction limits, but pose a falling hazard to the Work site

E. Erect and maintain temporary fencing around drip line of individual trees or around perimeter drip line of groups of trees to remain before starting site clearing. Remove fence when construction is complete.
   1. Do not store construction materials, debris, or excavated material within fenced area.
   2. Do not permit vehicles, equipment, or foot traffic within fenced area.
   3. Maintain fenced area free of weeds and trash.

F. Unless otherwise indicated, do not excavate within tree protection zones.

G. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
   1. Cover exposed roots with burlap and water regularly.
   2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
   3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
   4. Cover exposed roots with wet burlap to prevent roots from drying and backfill with soil as soon as possible.

H. Repair or replace trees and vegetation damaged due to Contractor's negligence, in a manner approved by Engineer.
   1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
   2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

A. Contractor will locate, identify, arrange for disconnect and seal or cap off utilities indicated to be removed before site clearing.
   1. Verify that utilities indicated as abandoned have been disconnected and capped before proceeding with site clearing.
   2. Arrange with utility companies having jurisdiction to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving occupied Owner facilities unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Engineer not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Engineer's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

D. Removal of underground utilities may also be included in Division 2 Sections covering site utilities. Removal of underground utilities may also be included in Division 22 – Plumbing, or Division 26 - Electrical.

E. After removal of underground utilities, properly cap and/or plug existing lines to remain in accordance with AHJ's.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
   3. Grind stumps and completely remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.

4. Use only hand methods for grubbing within drip line of remaining trees.
5. Dispose of all slash, trees, root material offsite.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earth moving is indicated.
1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Facilitate revegetation of disturbed soil areas by salvaging and storing existing topsoil and reuse it in restoration efforts.

B. Stripping:
1. Strip topsoil in areas impacted by construction, including, but not limited to, staging areas, trench sections, areas of demolition and in the vicinity of new structures.
2. Strip topsoil to a depth of 3 to 24 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
3. Remove subsoil and non-soil materials from topsoil, including trash, debris, weeds, and other waste materials. Native organics, not including exotic weeds, can be incorporated into the topsoil.
4. Surplus topsoil stripped beyond a depth of 6-inches shall be hauled to locations within the project area that are deficient in topsoil and utilized for final surface restoration.
5. Strip any topsoil within staging or material stockpile areas, near existing and future buildings prior to completing any excavation Work.

C. Whenever possible, salvage and preserve disturbed vegetation for reuse.

3.6 TOPSOIL STOCKPILING

A. Store topsoil for as short a time as possible to prevent loss of seed and root viability, loss of organic matter, and degradation of the soil microbial community.

B. Stockpile separately ecologically specific topsoil. Topsoil originating from sagebrush, wetland or lodgepole dominate habitat type shall be separated. Install temporary signs identifying each type of topsoil and location of origination. Redistribution of topsoil types shall be synonymous with the habitat type from which it originated.

C. Do not compact, or operate equipment on stripped topsoil windrows or stockpiles. Use best management practices (BMP) to prevent topsoil contaminations and wasting.

D. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Limit height of topsoil stockpiles to 36 inches.
2. Grade and shape stockpiles to allow unimpeded drainage of surface water.
3. Do not stockpile topsoil within drip line of existing trees.
4. Stockpile surplus topsoil to allow for re-spreading a thicker layer of topsoil, or utilization in areas with a topsoil deficit.
5. Stockpile topsoil away from excavations and future work and protect it from mixing with other materials and the subsoil.

E. If topsoil will be stored for more than a short time (>12 months), use seeding with a fast-growing native species to provide a protective cover and prevent the introduction of exotic plants. Maximize the use of previously disturbed areas for staging and stockpile areas to minimize ground disturbance.

3.7 PAVED SURFACES

A. Remove existing above and below grade improvements as indicated and as necessary to facilitate new construction.

B. Unauthorized removal and replacement of paved surfaces in excess of quantities indicated in the drawings and/or established in the field by the Engineer will be done so at Contractor's expense.

C. Remove slabs, paving, curbs, gutters, and aggregate base as indicated on plans.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
      a. Pavement cuts shall be a minimum of two (2) feet wider than the actual trench opening, parallel to the general trench alignment and centered over the trench.
   2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

D. Asphalt Milling: Contractor may elect to reuse milled asphalt paving generated from onsite materials as reclaimed aggregate base course. Asphalt milling and reuse shall comply with the following:
   1. Reclaimed Aggregate Base Course may be utilized as base material under final asphalt paving in place of imported aggregate base course. Use of this material for other applications shall be approved by the Engineer.
   2. Mill the entire existing asphalt paving thickness, together with a minimum of the top 2 inches of existing aggregate base, and uniformly mixed. Strip and stockpile in the staging area, or Owner approved location for use as Reclaimed Aggregate Base Course.
   3. The milling machine shall be operated such that a maximum asphalt size resulting from the operation is 1- inch. Multiple passes shall be provided if necessary to obtain the maximum size criteria.
   4. Limit lines of pavement removal shall be placed on the asphalt prior to the milling process. Limits of pavement removal shall be approved by the Engineer, or designee.
   5. Operator shall use caution to not mill to a depth that will contaminate the finish material with underlying material.

3.8 DISPOSAL

D. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them offsite.

END OF SECTION 31 10 00

SECTION 31 23 16 - EXCAVATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Soil densification.
   2. Excavating for building foundations.
   3. Excavating for paving and roads
   4. Excavating for slabs-on-grade.
   5. Excavating for site structures.

B. Related Sections:
   1. Section 01 11 00 – Summary of Work
   2. Section 31 05 13 – Soils for Earthwork: Stockpiling excavated materials.
   3. Section 31 05 16 – Aggregates for Earthwork.
   4. Section 31 10 00 – Site Clearing: Vegetation, topsoil and paved surface removal, stockpiling, reuse and disposal.
   5. Section 31 23 17 –Trenching: Excavating for utility trenches.
   6. Section 31 23 18 - Rock Removal: Removal of rock during excavating.
   7. Section 31 23 19 – Dewatering.
   8. Section 31 23 23 – Fill.
   9. Division 33 – Buried Utilities.

1.3 REFERENCES

A. Local utility standards when working within 24 inches of utility lines.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with:
   1. State standards.
   2. Applicable provisions of 20 CFR 1910 and 1926 (OSHA).

1.5 FIELD MEASUREMENTS

A. Verify that survey benchmark and intended elevations for the Work are as indicated.

PART 2 PRODUCTS

(Not Used.)

PART 3 EXECUTION

3.1 PREPARATION

A. Locating Utilities: Comply with Section 01 73 40 – Execution, for utility location.

B. Identify required lines, levels, contours, and datum.

C. Protect utilities indicated to remain from damage.

D. Notify applicable utility companies to remove, abandon, and/or relocate utilities interfering with excavation.

E. Protect bench marks, survey control points, existing structures, fences, paving, and curbs from excavating equipment and vehicular traffic.

F. Maintain stream channels and/or flow diversion channels to allow for passage of storm water runoff without adversely increasing upstream water levels and causing erosion outside limits of disturbance indicated on the drawings.

G. Complete clearing, tree removal and soil stripping in accordance with Section 31 10 00 – Site Clearing.

H. Install groundwater dewatering equipment in accordance with an approved plan. Comply with Section 31 23 19 – Dewatering.

3.2 EXCAVATION

A. Blasting of rock is prohibited.

B. Underpin adjacent structures which may be damaged by excavation work.

C. Excavation cuts and utility trenches shall be laid back to safe slopes or properly shored. Excavations and shoring operations should be conducted in accordance with the most recent versions of the OSHA Construction Standards for Excavations, Part 1926, Subpart P. Safety of construction personnel is the responsibility of the Contractor. Excavations for utilities shall be shored if the proper slope cannot be maintained.

D. Excavate to lines and grades indicated. Excavate subsoil to accommodate building foundations, slabs-on-grade, paving and site structures.
   1. Correct over-excavation according to Section 31 23 23 – Fill.

E. Excavated material under this project is unclassified in nature and includes any and all materials encountered, regardless of their consistency or the manner in which they are removed.

F. Excavate rock to a minimum depth of 6 inches and a maximum depth of 12 inches below subgrade.

G. When required, excavate to working elevations for temporary earth support. Coordinate special requirements for temporary earth support.

H. Excavation cut not to interfere with normal 45 degree bearing splay of foundation, unless appropriate temporary earth support is designed and provided and cut slope is stable and maintained.

I. Provide adequate working space and clearances for Work performed within excavations and for installation and removal of concrete forms.

J. Manholes and Vaults: Excavate at least 6 inches below bottom of base to establish subgrade to 98 percent of maximum density and place approved select backfill and granular fill for leveling to the elevation required for manhole or vault base installation in accordance with Section 31 23 23 – Fill.

K. If the foundation is unstable at grade established for new facilities, remove unsuitable material to a depth of 18 inches below bottom of foundation and replace with granular backfill at no additional cost to the Owner.

L. Grade top perimeter of excavation to prevent surface water from draining into excavation.

M. Trim excavation. Remove loose matter and rocks. Remove lumped subsoil, boulders, and rock as specified in Section 31 23 23 – Fill.

N. Work around bracing while maintaining integrity of temporary earth support system or temporary shoring.

O. Notify Engineer of unexpected subsurface conditions.

P. If, in the opinion of the Engineer, unsuitable foundation material is encountered, the Contractor shall repair the area by over excavating, filling with granular fill material, and compacting to 95 percent of the maximum density at no additional expense to the Owner.

Q. Remove excess and unsuitable material from site.

R. Correct areas over excavated with pit run, granular material or select structural fill as directed by the Engineer. Comply with Section 31 05 16 – Aggregates for Earthwork,
   1. Correct unauthorized excavation, or areas over-excavated by error at no extra cost to the Owner.

S. Stockpile excavated material in designated areas in accordance with Section 31 05 13 – Soils for Earthwork and 31 05 16 – Aggregates for Earthwork.

T. Repair or replace items indicated to remain damaged by excavation.

3.3 SHEETING, SHORING, AND BRACING

A. Provide proper and substantial sheeting, shoring, and bracing, as required, to prevent caving or sliding, to protect workmen and the Work, to protect existing structures and facilities, to limit the area of excavation, and as required by state and federal laws including 29 CFR 1910 and 1926.

B. Design and build sheeting, shoring, and bracing to withstand all loads that might be caused by earth movement or pressure, and to be rigid, maintaining shape and position under all circumstances.

C. For excavations over 5 feet deep, provide suitable barricades for worker protection.

D. When Work area is left open and unattended by the Contractor, provide suitable barricades for public safety and to prevent animal entry, regardless of depth.

E. For excavation over 4 feet deep, provide suitable exit means in accordance with applicable provisions of 20 CFR 1910 and 1926.

3.4 FIELD QUALITY CONTROL

A. Comply with Sections 01 40 00 – Quality Requirements and 31 23 23 – Fill, for field inspection and testing.

B. Request visual inspection of bearing surfaces by qualified inspection agency and Engineer before installing subsequent work.

C. All excavations and temporary earth support systems shall comply with all federal, state and local regulations.

3.5 PROTECTION

A. Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation. Provide temporary shoring for utility trench excavation as required by federal laws including 29 CFR 1910 and 1926.

B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

C. Protect structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth operations.

END OF SECTION 31 23 16

SECTION 31 23 17 - TRENCHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Excavating trenches for utilities to include water, sewer, and drainage pipelines; underground electrical and fiber conduit; phone; pull boxes; manholes and vaults; and all related appurtenances.
   2. Installation of Type 1 and Type 2 bedding around pipes.
   3. Compacted Final Trench Backfill from top of Type 1 Pipe Bedding to the proposed bottom of replaced topsoil or Imported Aggregate Base Course.
   4. Installation of Imported Aggregate Base Course.
   5. Underground Warning Tape.

B. Related Sections:
   1. Section 01 11 00 – Summary of Work
   2. Section 31 05 13 - Soils for Earthwork: Stockpiling excavated materials.
   3. Section 31 05 16 - Aggregates for Earthwork.
   4. Section 31 23 24 – Flowable Fill.
   5. Section 33 11 13 - Public Water Utility Distribution Piping

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D6913 – Standard Test Methods for Particle-Size Distribution of Soils Using Sieve Analysis.
   3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS

A. Utility: Any buried pipe, culvert, duct, conduit, or cable, including related appurtenances such as concrete vaults, manholes, wet wells, or pull boxes.

B. Excavation and backfill for site structures including the new facilities at the WWTP is included in Sections 31 23 16 – Excavation and 31 23 23 – Fill.

C. Trench Excavation is categorized as follows:
   1. **Type 1 Trench Excavation** does not mandate shoring or sheathing, unless desired by the Contractor. The sides of all trenches may be sloped back to preclude collapse in accordance with OSHA regulations, provided that the excavation does not encroach outside of established limits of disturbance.
   2. **Type 2 Trench Excavation** shall be adequately shored or sheathed in accordance with the requirements of OSHA regulations. Portable trench boxes or sliding trench shields may be used for performing Type 2 Trench Excavation in lieu of a shoring system provided that they are designed and maintained in a manner which will provide protection equal to or greater than the sheathing or shoring required for the trench. Trench boxes or sheathing used shall extend to the full height of the trench excavation. Site trenching at Teton Village is considered Type 2.
   3. **Type 2 Excavation** is required at Teton Village. If undesignated, the Contractor may select his preferred excavation type, based on soil type, groundwater depth, available space to complete the work, and proximity to adjacent structures or utilities.

1.5 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for Underground Warning Tape and Cement Treated Flowable Fill.

C. Soil Testing: Submit gradation tests, moisture-density relationship tests and compaction tests completed in paragraph 3.6 – “Field Quality Control”, below.

D. For Type A Trench Backfill: One in-place compaction test as specified in ASTM D2922-96e1 and ASTM D3017-96e1 for every 100 lineal feet of trench in the compacted embedment zone and at every 1½ feet of vertical lift of backfill materials. Complete a minimum of two tests per location. Compacting testing is an Owner-furnished (paid for) service. Contactor shall notify Engineer when testing services are required.

1.6 CLOSEOUT SUBMITTALS

A. Tracer Wire Continuity Testing: Record and submit field testing results.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Type 1 and Type 2 Pipe Bedding and Imported Aggregate Road Base material requirements are specified in Section 31 05 16 – Aggregates for Earthwork. Reclaimed aggregate base course containing bituminous materials shall not be used as pipe bedding.

B. Final Trench Backfill shall consist of native trench cuttings not containing debris, frozen material, unstable material or large clods. Stones greater than three inches shall not be placed within two feet of the pipe.

C. Cement Treated Flowable Fill: Comply with Section 31 23 24 – Flowable Fill.

2.2 ACCESSORIES

A. When underground warning tape for existing utilities is damaged or removed, Contractor shall obtain warning tape from Utility Owner for replacement, or procure and replace warning tape suitable to utility Owner and Engineer.

B. Water Mains and Services: Underground warning tape, Utilitape brand, 6” wide, premium grade or equal, blue in color, with the message “Caution-Water Pipe Below.”

C. Buried Fiber: Underground warning tape, Utilitape brand, 6” wide, premium grade or equal, orange in color, with the message “Caution - Fiber Optic Below.”

D. Buried Sewer: Underground warning tape, Utilitape brand, 6” wide, premium grade or equal, green in color, with the message “Caution-Sewer Pipe Below.”

E. Buried Electric: Underground Warning Tape: Utilitape brand, 6” wide, premium grade or equal, red in color, with the message “Caution-Electrical Below.”

F. Tracer Wire (Plastic Pipe Only):
   1. Type: 12 awg copper clad steel (CCS) direct bury tracer wire.
   2. Jacket Color: Blue or green in accordance with APWA uniform color code.
   3. Jacket Coating: High Density Polyethylene (HDPE) or High Molecular Weight Polyethylene (HMWPE).
   4. Connections: Copperhead SnakeBite, 3M DBR, or approved equal.
   5. Bus Bars: Blue Sea 2303 located interior to buildings, or approved equal.
      a. Bus Material: Tin-Plated Copper CDA 110/UNS11000
      b. Studs: ¼’ Stainless Steel.
      c. Base Material: Glass Reinforced Polycarbonate
      d. Installation Accessories: S.S. Anchor Bolts and nuts.

2.3 PIPE INSULATION

A. Insulation: Insulation for buried water and force main sewer lines shall be 2-inch thick high density Dow Extruded Blue polystyrene foam board for buried service or approved equal.

1. The five-year aged R Value per inch shall be five (5) when tested at 75 degrees F mean temperature in accordance with ASTM Specification C-518.
2. Minimum compressive strength of 25 psi when tested in accordance with ASTM D-1621.
3. Maximum water absorption of 0.1% by volume when tested in accordance with ASTM C-272.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Trenching shall be provided to allow for installation of utilities to lines and grades indicated on Drawings.
   1. Engineer reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.

B. Minimum water or sewer pipe cover from finish grade shall be no less than six (6) feet. If water or sewer line depth is less than six (6) feet, install insulation for frost protection.

3.2 PREPARATION

A. Comply with requirements specified in Section 01 73 40 – Execution, for locating and verifying existing utilities.

B. Identify required lines, levels, contours, and datum locations.

C. Protect plant life and other features remaining as portion of final landscaping.

D. Protect bench marks and all permanent and temporary survey monuments within work area. Disturbance will require replacement at the Contractor's expense.

E. Protect existing resources located outside work limits from excavating equipment and vehicular traffic.

F. Maintain structures and protect above and below grade utilities indicated to remain.

G. Establish temporary pedestrian and vehicular traffic control when trenching is performed in public right-of-way. Relocate controls as required during progress of Work. Comply with requirements of the Traffic Control Plan and Section 01 55 26 – Traffic Control.

3.3 TRENCHING

A. Trench-excavated material under this Project is unclassified in nature and includes any and all materials encountered, regardless of their consistency or the manner in which they are removed.

B. Site clearing requirements along utility alignments is provided under Section 31 10 00 – Site Clearing.

C. Complete all trenching and subsidiary operations within the "limits of disturbance" (LD) work boundaries shown on the drawings.

D. Perform large rock removal resulting from trench excavation as indicated in Section 31 23 18 – Rock Removal.

E. Perform excavation within 48 inches of existing utilities in accordance with Utility Owner's requirements.

F. When Work area is left open and unattended by the Contractor, provide suitable barricades for public safety and to prevent animal entry, regardless of depth. There is no restriction on allowable length of open trench during the day, however, no more than 50 feet of trench shall remain un-backfilled to finish grade at the end of each working day. Install orange plastic construction fencing around unbackfilled trench at the end of each day.
   1. On weekends, maximum allowable open trench shall be 25 feet.

G. Conduit and Pipe Excavation Requirements:
   1. Plastic Pressure Pipe: Cut trenches to a minimum width of the pipe outside diameter plus 12-inches; the Engineer may require a greater minimum width if necessary to successfully consolidate Type 1 Pipe Bedding material around the pipe, depending on the Contractor's method of bedding installation.
   2. Ductile Iron Pipe: Minimum trench width shall be no less than the pipe outside diameter plus 18 inches.
   3. PVC Sewer Main: Minimum trench width from the trench bottom to a point six inches above the top of the pipe shall be no less than the outside diameter of the pipe plus 18-inches to allow proper compactive effort along both sides of the pipe.
   4. PVC Conduits: Minimum trench width shall be no less than the pipe outside diameter plus 18 inches.

H. Excavate trenches to depth indicated on Drawings, 6-inches below pipe bottom. Provide uniform and continuous bearing and support for bedding material.

I. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by the Engineer until suitable material is encountered. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type 2 Pipe Bedding and compact to density equal to or greater than requirements for subsequent backfill material.

J. Grade site accordingly to prevent surface water from flowing into excavations.

K. Adequate provisions shall be made for maintaining the flow of sewers, water pipes, drains, and water courses encountered during construction.

L. In trench areas where groundwater is encountered, groundwater shall be removed from the trench to a level of at least proposed pipe bottom prior to installation. In no case will pipe installation in free water be allowed. Trench dewatering, when required, shall be continued until backfill above the water surface can be completed without sacrificing required backfill compaction.

M. Whether utilizing Type 1 or Type 2 Trench Excavation, the Contractor shall be solely responsible to insure that all trench excavations are completed in a manner conforming to OSHA. The

Contractor shall employ a qualified and properly trained onsite "responsible person" to perform safety inspections of the trenches, and supervise the handling of all operations involving safety procedures, as prescribed by OSHA (29 CFR 1910 and 1926).

N. Comply with Section 01 35 23 – Safety Equipments.

O. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.

P. Correct areas over excavated with compacted Type 2 Pipe Bedding, or suitable material approved by the Engineer.

Q. Remove excess subsoil not intended for backfill from the Work site. Haul and dispose of unsuitable soils offsite.

R. Stockpile excavated material in area designated on-site in accordance with the drawings, or as directed by the Engineer.

3.4 SHEETING AND SHORING

A. Provide temporary shoring for utility trench excavation as required by federal laws including 29 CFR 1910 and 1926.

B. For excavation over 4 feet deep, provide suitable exit means in accordance with applicable provisions of 20 CFR 1910 and 1926.

C. Where required, sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

D. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

E. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Type 1 Pipe Bedding Material
   1. Processed or imported Type 1 Pipe Bedding Material shall be moisture conditioned, installed in the trench bottom, leveled and consolidated to a six inch thickness with multiple passes of a vibratory plate compactor prior to pipe placement within the trench. Type 1 Pipe Bedding Material shall be consolidated to at least 85% Standard Proctor Density (ASTM D698).
   2. The interface between the pipe bottom and installed bedding material shall be constructed to provide uniform and stable support for the full length of the pipe. Excavation for each bell shall be provided at each bell location.
   3. Remaining bedding material shall be moisture conditioned, installed, leveled, and consolidated in maximum six inch lifts to a finish elevation of six inches above the pipe crown by use of mechanical or hand methods capable of assuring complete and uniform soil support around the pipe haunches without damage to the pipe. The Contractor will be

required to partially re-excavate installed bedding by pothole excavation on a periodic basis to demonstrate that adequate soil support around the pipe haunches is being provided.

4. Trench boxes, if utilized, shall be installed with their base no lower than the proposed top of pipe bedding to insure that trench box removal does not loosen the installed bedding material.
5. If Type 1 Pipe Bedding is free-draining, and groundwater is expected above the pipe, a three foot thick clay plug shall be installed around the pipe at 500 foot intervals to inhibit moisture migration along the pipe centerline.

B. Type 2 Pipe Bedding Material-Used in areas of soft or unstable trench bottom.
   1. Install across entire trench width to a depth dictated by the Engineer.
   2. Consolidate material as required to provide a stable base for the pipe. Finish top of Type 2 material shall be six inches below the pipe bottom.
   3. If consolidation results in repeating soft or unstable subgrade, re-excavate and replace bedding material.

C. Cement Treated Flowable Fill
   1. Install in areas where adequate compaction cannot be achieved through mechanical means.
   2. Install according to details provided in the plans, or as required by the Engineer. Refer to the detail sheets for typical trench sections for utility crossings.

D. Pipe Insulation
   1. Install 2 feet wide boards centered above the pipe crown as described in details provided in the plans.
   2. Bed insulation board in 3-inch minus native soil.
   3. Install insulation where water or pressure sewer line depth is less than 5 feet bury and/or 6 feet bury in roads.

E. Underground Warning Tape:
   1. Install as shown on the typical waterline trench details provided in the drawings.
   2. Replace underground warning tape that is damaged, or has been removed during construction for existing utilities to remain. Obtain replacement warning tape from Utility Owner, or re-install with approved alternative.

F. Tracer Wire and Terminal Boxes:
   1. Install tracer wire continuous over the top of all plastic pipe.
   2. Tape to pipe at ten foot intervals.
   3. Provide with adequate slack to prevent breakage during the backfill process.
   4. Splices are to be avoided wherever possible. Required splices shall be completed by use of a butt style connector, heat shrink sleeve, and a slack loop.
   5. Terminate tracer wire inside the WWTP, inside manholes and in terminal boxes. The maximum continuous run of tracer wire without a termination shall be 1000 lineal feet.
      a. Tracer wire terminations at terminal boxes shall be made utilizing terminal clips as recommended by the manufacturer. Install terminal boxes in accordance with the manufacturer's recommendations and in locations approved by Engineer.
      b. Terminated tracer wire at a bus bar inside manholes and structures.
      c. Provide a minimum of 12 inches of slack wire when terminating inside structures.

6. The continuity of all tracer wire segments will be verified by the Contractor and Engineer prior to final acceptance. Submit test results in accordance with the Closeout Submittals article above.

G. Final Trench Backfill
   1. All trenches shall be backfilled immediately after Type 1 Pipe Bedding is installed. Leakage or pressure testing of water and sewer lines shall be performed after backfill.
   2. Final Trench Backfill shall be free of cinders, ashes, refuse, organic and frozen material, or other materials that are unsuitable. No stone larger than 3" shall be placed within two feet of any utility line.
   3. Final trench backfill beneath roadways and walks shall be considered Type A Trench Backfill. Type A Trench Backfill shall be moisture conditioned to ±2% of optimum moisture content, deposited in compacted lifts not to exceed eight inches in thickness and mechanically compacted to at least 95% of maximum density as determined by ASTM D698 (Standard Proctor). In areas where Type A Trench Backfill is required, the Contractor shall, for a minimum period of one year after final completion, repair any trench settlement which may occur, and shall make suitable repairs to any pavement, sidewalks, or other structures which may become damaged as a result of backfill settlement.
   4. Final trench backfill in areas other than beneath roadways and walks shall be considered Type B Trench Backfill. Type B Trench Backfill shall be moisture conditioned to ±2% of optimum moisture content, deposited in compacted lifts not to exceed twelve inches in thickness and mechanically compacted to at least 90% of maximum density as determined by ASTM D698 (Standard Proctor).

H. Imported Aggregate Base Course
   1. In streets, sidewalks, driveways and other travel ways, the Contractor shall provide a minimum six inch thick of grading H or W temporary gravel surface flush with existing pavement or concrete until the disturbed surface can be restored. The Contractor is responsible for maintaining a smooth travel way in areas receiving temporary surfacing. The Contractor is obligated to fulfill requests made by the Engineer regarding maintenance of temporary surfaces.
   2. Final surfacing for existing gravel driveways shall consist of a minimum of six compacted inches of Imported Aggregate Base Course or Recycled Road Base.
   3. Imported Aggregate Base Course utilized as subbase beneath asphalt paving shall be a minimum of six compacted inches thick.
   4. Imported Aggregate Base Course utilized as temporary or final surfacing or subbase shall be installed to 95% of maximum density as determined by ASTM D698 (Standard Proctor).

I. The entire trench alignment, upon completion of backfilling operations, shall be machine graded to a surface contour condition ready for topsoil or asphalt replacement to pre-existing contours. Remove excess material not utilized for trench backfill from the site.

3.6 FIELD QUALITY CONTROL

A. Owner will supply and pay for an accredited testing firm to provide lab proctors and field density test final trench backfill compaction. All testing results will be provided to the Contractor, Engineer and Owner. Testing requirements include:
   1. Two initial gradation tests for each type of material plus one additional test for each 500 cubic yards of each material

2. Two moisture-density relationship tests as specified in ASTM D698-91(1998), or two relative density tests as specified in ASTM D4253-93(1996) and ASTM D4254-91(1996), as appropriate for each type of embedment or backfill material proposed, except granular embedment material.
3. For Type A Trench Backfill: One in-place compaction test as specified in ASTM D2922-96e1 and ASTM D3017-96e1 for every 100 lineal feet of trench in the compacted embedment zone and at every 1½ feet of vertical lift of backfill materials. In addition, complete a minimum of two per location, or one in-place compaction test every 100 lineal feet on final surface of compacted subgrade and base course located in roads, sidewalks or other travel ways.
4. For Type B Trench Backfill: One in-place compaction test as specified in ASTM D2922-96e1 and ASTM D3017-96e1 for every 300 lineal feet of trench in the compacted embedment zone and at every 1½ feet of vertical lift of backfill materials.
5. One in-place compaction test as specified in ASTM D2922-96e1 and ASTM D3017-96e1 near the top of the trench every 100 lineal feet (Type A Trench Backfill) and 300 lineal feet (Type B Trench Backfill) for trench depths of 2 feet or less
6. Ten additional in-place compaction tests as specified in ASTM D2922-96e1 and ASTM D3017-96e1, at the discretion of the Engineer.
7. Maximum density of material containing more than 30% oversize (greater than ¾" diameter) cannot be determined by use of the ASTM Designation D698. In this case, a field maximum density may be determined by a test strip method. The material shall be compacted at or near optimum moisture content and a field density test, as specified in ASTM D2922-96e1 and ASTM D3017-96e, shall be taken after each pass of the compaction equipment. This sequence shall continue until the maximum field density is achieved. This maximum field density shall be used for subsequent field compaction tests. Enough density tests should be taken to monitor proper compaction.

B. Proof roll compacted fill surfaces under slabs-on-grade, paving and foundations with heavy equipment (loader or haul truck) supplied by the Contractor at the request of the Engineer.

1. Remove and repair areas of unstable material when requested by Engineer at no additional cost to the Owner

C. Conform to Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

D. When tests indicate Work does not meet specified requirements, remove defective Work, replace, compact, and retest.

3.7 PROTECTION OF FINISHED WORK

A. Section 01 73 40 - Execution: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION 31 23 17

SECTION 31 23 19 - DEWATERING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Review the Geotechnical Report attached subsequent to Section 01 11 00 for additional dewatering criteria and requirements.

1.2 SUMMARY

A. Section Includes:
   1. Dewatering system.
   2. Surface water control system.
   3. System operation and maintenance.
   4. Water disposal.

B. Related Sections:
   1. Section 01 11 00 – Summary of Work
   2. Section 31 23 16 – Excavation
   3. Section 31 23 17 - Trenching

1.3 REFERENCES

A. ASTM International:
   1. ASTM C33 - Standard Specification for Concrete Aggregates.

1.4 DEFINITIONS

A. Dewatering includes the following:
   1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations and trenches. Work that requires potential seasonal groundwater dewatering including construction of new facilities.
   2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations and trenches.
   3. Disposing of removed water.

B. Surface Water Control: Removal of surface water within open excavations.

1.5 SYSTEM DESCRIPTION

A. Provide dewatering and surface water control systems to permit Work to be completed on dry and stable subgrade.

1. Install well points and dewatering pits with pumps to dewater and relieve hydrostatic pressure within strata identified as sands and gravels in subsurface investigation (see soil logs in the drawings).

B. Monitoring wells onsite (see plans) may be used to identify periods where it is most advantageous to start deep basin excavation and construction work.

C. If the Contractor elects to install a temporary dewatering system, the Contractor shall furnish standby equipment stored at Project site and ready for immediate use upon failure of dewatering equipment. Provide the following standby equipment, but not less than one of each type:
   1. Dewatering Pumps: 100 percent.
   2. Pump Power Units: 100 percent.
   3. Commercial Electric Power: 100 percent standby electric generating equipment.

1.6 PERFORMANCE REQUIREMENTS

A. Design dewatering systems to:
   1. Lower water table within areas of excavation to a minimum of three (3) feet below bottom of excavation to permit Work to be completed on dry and stable subgrade.
   2. Relieve hydrostatic pressures in water bearing strata below excavation to eliminate risk of uplift or other instability of excavation.
   3. Prevent damage to adjacent properties, buildings, structures, utilities, and facilities from construction operations.
   4. Prevent loss of fines, quick condition, or softening of foundation subgrade.
   5. Maintain stability of sides and bottoms of excavations and trenches.
   6. Contractor shall arrange for and incur all costs associated with legal disposal/discharge of groundwater on or off site. Groundwater shall not be disposed to Class 1 waters (Fish Creek).

B. Design surface water control systems to:
   1. Collect and remove surface water and seepage entering excavation.

1.7 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.

B. Shop Drawings:
   1. Indicate dewatering system layout, well and dewatering pit depths, well screen lengths, dewatering pump locations, pipe sizes and capacities, grades, filter sand gradations, surface water control devices, valves, and water disposal method and location.
   2. Indicate primary and standby power system location and capacity.
   3. Indicate layout and depth of monitoring wells, piezometers and flow measuring devices for system performance measurement.
   4. Include detailed description of dewatering and monitoring system installation procedures and maintenance of equipment.
   5. Include description of emergency procedures to follow when problems arise.

C. Product Data: Submit data for each of the following:
   1. Dewatering Pumps: Indicate sizes, capacities, priming method and motor characteristics.

2. Pumping equipment for control of surface water within excavation.

D. Design Data:
   1. Indicate design values, analyses, and calculations to support design.
   2. Include description and profile of geology, soil, and groundwater conditions.

E. Field Reports: Test and monitoring reports as specified in Field Quality Control article.

F. Permits: Submit signed copies.

1.8 CLOSEOUT SUBMITTALS

A. Sections 01 77 00- Closeout Procedures: Requirements for submittals.

1.9 QUALITY ASSURANCE

A. Comply with authorities having jurisdiction for the following:
   1. Drilling and removal of wells used for dewatering systems.
   2. Water discharge and disposal from pumping operations.

B. Obtain permit for dewatering operations from the the Wyoming Department of Environmental Quality (WDEQ) for Temporary Discharge Involving Construction Activities. Comply with PART 1.9, Section 01 31 00 – Project Management and Coordination.

C. Perform Work in accordance with state standards.

D. Maintain two copies of each document on site.

1.10 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with a minimum of 5 years documented experience and responsible for design, operation, and maintenance of dewatering system.
   1. Assume sole responsibility for dewatering, surface water control systems, permit compliance and for loss or damage resulting from partial or complete failure of protective measures and settlement or resultant damage caused by groundwater control operations.

1.11 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum two weeks prior to commencing work of this Section.

1.12 SEQUENCING

A. Section 01 11 00 – Summary of Work: Requirements for work phasing.

B. Sequence or phase work to obtain required permits before start of dewatering operations.

C. Sequence work to install and test monitoring systems minimum 7 days before testing and operating dewatering systems.

D. Sequence work to install and test dewatering and surface water control systems minimum 7 days before starting excavation or trenching.

1.13 COORDINATION

A. Section 01 31 00 – Project Management and Coordination: Requirements for coordination.

B. Coordinate work to permit the following construction operations to be completed on dry stable substrate.
   1. Excavation for structures specified in Section 31 23 16.
   2. Trenching for utilities specified in Section 31 23 17.

PART 2 PRODUCTS

2.1 DEWATERING AND MONITORING EQUIPMENT

A. Select dewatering, monitoring and accessory equipment to meet specified performance and permitting requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination Verification of existing conditions before starting work.

B. Conduct additional borings and investigations to supplement subsurface investigations already completed.

C. Locate existing buried utilities in accordance with PART 3.1, Section 01 73 40 – Execution, Prior to performing Work.

D. Employ licensed land surveyor to provide following documentation:
   1. Survey existing adjacent buildings, structures, and improvements for position and elevation of principal elements before and after completion of dewatering operations.

3.2 PREPARATION

A. Protect existing adjacent buildings, structures, and improvements from damage caused by dewatering operations.

B. Verify capacity of existing electrical systems and install temporary power rack and meter for power supply to the dewatering system. Service and power costs shall be borne by Contractor.

3.3 MONITORING

A. Install monitoring wells or devices according to the approved shop drawings.

B. Test each monitoring point to verify installation is performing properly.

C. Install level indicators, calibrate, and test for proper operation.

D. Protect monitoring equipment from damage by construction operations.

E. Maintain accessibility to monitoring equipment continuously during construction operations.

F. Maintain monitoring equipment until groundwater is allowed to return to normal level.

3.4 DEWATERING SYSTEM

A. Install dewatering system in accordance with the approved shop drawings.

B. Locate system components to allow continuous dewatering operations without interfering with installation of permanent Work and existing public rights-of-way, sidewalks, and adjacent buildings, structures, and improvements.

C. When wells are used:

1. Drill wells in sizes and to depth indicated in the shop drawings.
2. Provide temporary surface casing when required to stabilize soil while advancing well.
3. Test well for proper water flow through well screen and pumping rate for dewatering system operation. Repeat development until well meets performance requirements.
4. Install pumps in accordance with manufacturer's instructions.
5. Connect pumps to discharge header. Install valves to permit pump isolation.

D. Install Work in accordance with the WDEQ and Wyoming State Engineer's Office regulations and standards.

3.5 SURFACE WATER CONTROL SYSTEM

A. Provide ditches, berms, and other devices to divert and drain surface water from excavation area.

B. Divert surface water and seepage water within excavation areas into sumps and pump water into drainage channels or settling basins in accordance with requirements of authorities having jurisdiction.

C. Control and remove unanticipated water seepage into excavation.

3.6 SYSTEM OPERATION AND MAINTENANCE

A. Operate dewatering system continuously until backfill is minimum 2 feet above normal ground water table elevation.

B. Provide 24-hour supervision of dewatering system by personnel skilled in operation, maintenance, and replacement of system components.

C. Conduct daily observation of dewatering system and monitoring system. Make required repairs and perform scheduled maintenance.

D. Fill any fuel tanks before tanks reach less than 25 percent capacity.

E. When dewatering system cannot control water within excavation, notify Engineer and stop excavation work.
   1. Supplement or modify dewatering system and provide other remedial measures to control water within excavation. Costs for modifications shall be borne by the Contractor.
   2. Demonstrate dewatering system operation complies with performance requirements before resuming excavation operations.

F. Modify dewatering and surface water control systems when operation causes or threatens to cause damage to new construction, existing site improvements, adjacent property, or adjacent water wells.

G. Correct unanticipated pressure conditions affecting dewatering system performance.

H. Do not discontinue dewatering operations without Engineer's approval.

3.7 WATER DISPOSAL

A. Discharge water to approved/permitted locations.

B. Comply with AHJ's permitting requirements for construction dewatering and discharge to existing "surface waters of the State".

3.8 FIELD QUALITY CONTROL

A. Section 01 73 40 – Execution: Starting of Systems.

B. After dewatering system is installed, perform pumping test to determine when selected pumping rate lowers water level in well below pump intake. Adjust pump speed, discharge volume, or both to ensure proper operation of each pump.

C. Monitor and record the following, daily, until steady state conditions occur. Then monitor and record conditions weekly until excavation and backfill Work is completed.
   1. Average discharge flow rate for each deep pump/well.
   2. Ground water elevation.

D. Monitor ground water discharge for turbidity according to permit requirements.

E. Monitor ground water discharge for contamination while performing pumping in vicinity of potentially contaminated sites. Sample and test water weekly for contaminates. Note: There are no known contaminated sites in the vicinity of the Work.

F. Survey existing adjacent buildings, structures, and improvements prior to, during and subsequent to dewatering operations to detect movement in comparison to original elevations during dewatering operations.
   1. Notify Engineer immediately of measured movement.

G. Submit initial installation reports including the following:
   1. Installation and development reports for well points and pumps.
   2. Installation and baseline reports for monitoring equipment.
   3. Initial dewatering flow rates.

H. Submit weekly monitoring reports including the following:
   1. Dewatering flow rates.
   2. Groundwater elevation readings.
   3. Test reports of discharge water analysis.
   4. Maintenance records for dewatering and surface water control systems.

3.9 SYSTEM REMOVAL

A. Remove dewatering and surface water control systems and equipment after dewatering operations are discontinued.

B. When abandoning wells, comply with the WSEO's Rules and Regulations. Well casings shall be removed to a minimum depth of two (2) feet below finished grades.

END OF SECTION 31 23 19

SECTION 31 23 23 - FILL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Backfilling building perimeter to subgrade elevations.
   2. Backfilling site structures to subgrade elevations.
   3. Fill under slabs-on-grade.
   4. Fill Exterior to below grade walls.
   5. Fill under paving.
   6. Fill for over-excavation.
   7. Fill for conduits and drains.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete: Concrete materials.
   2. Section 31 05 13 - Soils for Earthwork: Soils for fill.
   3. Section 31 05 16 - Aggregates for Earthwork: Aggregates for fill.
   4. Section 31 23 16 - Excavation.
   5. Section 31 23 17 - Trenching: Backfilling of utility trenches.
   6. Section 31 23 24 - Flowable Fill.
   7. Section 32 91 19.13 – Topsoil Placement and Grading: Filling of topsoil to finish grade elevation.
   8. Division 33 – Buried Utilities.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
   1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
   1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).
   2. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
   3. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
   4. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
   5. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

6. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data for geotextile fabric indicating fabric and construction.

C. Samples: Submit, in air-tight containers, 5 gallon bucket samples of each type of imported fill to testing laboratory.

D. Materials Source: Submit name of imported fill materials suppliers.

E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

F. Submit weed free certification for all imported materials.

G. Contractor shall be responsible for ensuring all samples of imported soils are submitted for approval well in advance of commencement of Work.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with State standards.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Concrete: Structural concrete as specified in Section 03 30 00 - Cast-In-Place Concrete.

B. Subsoil Fill: As specified in Section 31 05 13 – Soils for Earthwork.
1. Type S1: Select Fill.
2. Type S2: Landscaping Fill.
3. Type S3: Native Topsoil.
4. Type S4: Imported Topsoil.
5. Type S5: Embankment Material.

C. Aggregates: As specified in Section 31 05 16 – Aggregates for Earthwork.
1. Aggregate for Drains.
2. Imported and Reclaimed Aggregate Base Course.
3. Pit Run Aggregate (Structural Fill).
4. Cobble Rock.
5. Granular Fill.
6. Aggregate for Pervious Backfill Material.
7. Aggregate for Riprap.
8. Type 1: Pipe Bedding Material
9. Type 2: Pipe Bedding Material.

D. Material for Trenching: As specified in Section 31 23 17 – Trenching.
   1. Type A: Trench Backfill.
   2. Type B: Trench Backfill.

E. Flowable Fill: As specified in Section 31 23 24 – Flowable Fill.

2.2 ACCESSORIES

A. Geotextile Fabric: Composed of PVC coated polyester multifilament yarn.
   1. Manufacturer: Tencate Mirafi 3XT Geogrid or approved equal.
   2. Tensile Strength: 3500 lbs/ft
   3. Creep Reduced Strength: 2215 lbs/ft
   4. Mass/Unit Area: 8.2 oz/sq. yrds

B. Separation/Filter Fabric:
   1. Description: Fabric of PP or polyester fibers or combination of both, with flow rate range from 110 to 330 gpm/sq. ft. when tested according to ASTM D 4491.
   2. Structure Type: Nonwoven, needle-punched continuous filament.
      a. Survivability: AASHTO M 288 Class 2.
      b. Minimum Tensile Strength per ASTM D4632: 150 lbs
      c. Styles: Flat and sock

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination: Coordination and project conditions.

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify structural ability of unsupported walls to support loads imposed by fill.

3.2 PREPARATION

A. Prior to placement of fill material, compact subgrade at the bottom of each excavation to 95% of maximum density as determined by ASTM D698 (Standard Proctor) or native density, whichever is greater.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with pit run, granular fill or other approved structural fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 4 inches to provide adequate bond between old and new material.

D. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.

3.3 BACKFILLING

A. Maintain optimum moisture content of backfill materials to attain required compaction density.

B. General Backfill Requirements:
   1. Backfill areas to contours and elevations with unfrozen materials.
   2. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
   3. Place separation fabric according to the drawings and manufacturer's recommendations.
   4. Place fill material in continuous layers and compact in accordance with schedule at end of this section.
   5. Employ placement method that does not disturb or damage other work.
   6. Maintain optimum moisture content of backfill materials to attain required compaction density.
   7. Backfill against supported foundation walls according to the plans.
   8. Do not backfill against unsupported foundation walls. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
   9. Do not place backfill against concrete until concrete has cured for a minimum of 14 days or longer to sufficiently accept the load.
   10. If a trench passes through a structure backfill, compact backfill to an elevation of 12 inches above top of pipe before trenching.
   11. Slope grade away from building minimum 5 percent slope for minimum distance of 10 ft, unless noted otherwise.
   12. Make gradual grade changes. Blend slope into level areas.
   13. Remove surplus backfill materials from site.
   14. Leave fill material stockpile areas free of excess fill materials.

C. Comply with the following for backfill foundations (building and basin) walls of new WWTP facilities.
   1. Do not place backfill against concrete footings and walls until basins have been tested for water tightness in accordance with requirements provided in the tank structural drawings.
   2. Place select backfill and landscaping fill in accordance with the drawings while maintaining symmetrical backfill loading.
   3. Backfill completely with structural fill adjacent to walls where future building slabs will be located above; this applies for backfill within the clarifier building footprint.

D. Comply with the following for backfill around structures including vaults, manholes and other miscellaneous structures.
   1. Excavate at least 6 inches below bottom of base to establish subgrade compacted to at least 95% of maximum density as determined by ASTM D698 (Standard Proctor) and place granular fill to the elevation required for manhole or vault base.
   2. Place additional granular fill to a uniform level around the manhole or vault and to at least one foot above the top of the highest utility connection to the structure.
   3. Backfill around utility lines is specified in Section 31 23 17 – Trenching.

E. Comply with the following for backfill of depressions or structures resulting from demolition Work.
   1. Backfill depression or structures with native material to finished grade.
   2. Unless otherwise noted, backfill material shall be free of demolition waste.

3. Moisture condition and place fill in uniform lifts not to exceed 8-inches loose measurement.
4. Compact each layer before placing the next layer. As the compaction of each layer progresses, continually level and manipulate to ensure uniform moisture and density.

F. Construct embankments according to the following:
1. Before placing embankment, scarify ground surface to provide ample bond between old and new material.
2. Place select or landscaping fill in lifts not exceeding 8 inches loose measurement.
3. Compact each layer before placing the next layer. As the compaction of each layer progresses, continually level and manipulate to ensure uniform moisture and density.
4. All embankment side slopes shall be as indicated on the drawings.

3.4 COMPACTION

A. Compact with mechanical, platform-type tampers.

B. Use roller for compaction, if necessary, to prevent damage to structure and desired density can be obtained.

C. Compaction by inundation with water shall not be permitted.

D. Do not compact backfill in water.

E. Moisture density control will not apply to portions of embankment that are identified as rock embankment.

F. Compact disturbed load bearing soil in direct contact with foundations to original bearing capacity.

3.5 SURFACE FINISH WORK

A. Decompact the top 12 inches of subgrade in areas to be reclaimed with native seed and pants. Subsequent to decompaction, remove rocks in excess of 3 inches in diameter from the top of subgrade. Areas to be decompacted include:
1. Contractor Staging areas.
2. Disturbed areas designated as future green/landscaping space.

B. Grading: Grade and finish subgrade to required levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas. Eliminate uneven areas and low spots, ensuring positive drainage.

3.6 TOLERANCES

A. Section 01 40 00 - Quality Requirements.

B. Top Surface of Backfill within Building Areas: Plus or minus ½ inch from required elevations.

C. Top Surface of Backfill under Paved Areas: Plus or minus ½ inch from required elevations.

D. Top Surface of General Backfill: Plus or minus 1.5 inches from required elevations.

3.7 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Perform laboratory material tests in accordance with the following:
   1. Particle Size Distribution (Gradation): ASTM D6913.
   2. Moisture Density Relationship: ASTM D698-91.
   3. Maximum Relative Density: ASTM D4253-93.
   4. Minimum Relative Density: ASTM D4254-91.

C. Perform in place compaction tests in accordance with the following (by Owner):
   1. Density Tests: ASTM D2922-96e1.
   2. Moisture Tests: ASTM D3017-96e1.

D. Owner will provide an accredited testing firm to provide the following lab proctors and field density testing of backfill following compaction. Testing will include:
   1. Two initial gradation tests for each type of material plus one additional test for each 500 cubic yards of each material
   2. Two moisture-density relationship tests or two relative density tests, as appropriate for each type of embedment or backfill material proposed, except granular embedment material.
   3. For Type A Trench Backfill: As specified in Section 31 23 17 – Trenching.
   4. For Type B Trench Backfill: As specified in Section 31 23 17 – Trenching.
   5. Backfill under Foundations: Perform compaction tests below new buildings and structures within the excavation and backfill zones at least:
      a. Once per 100 square feet per 2 feet maximum of vertical lift for each different material installed as fill adjacent to structures.
      b. Once per 50 square feet per 2 feet maximum of vertical lift for each different material installed for manholes, vaults and other miscellaneous structure foundations.
   6. Backfill Adjacent to Structure Walls: Perform compaction tests within structure excavation and backfill zones at least:
      a. Once per 100 square feet per 2 feet maximum of vertical lift for each different material installed as fill adjacent to structures.
      b. Once per 15 lineal feet of wall per 2 feet maximum of vertical lift for each different backfill material for manholes, vaults, and other miscellaneous below grade structures and foundations.
   7. Embankments: Test once per 100 square feet per 2 feet maximum of vertical lift for each different material.
   8. Backfill Resulting from Demolition Work: Perform compaction tests within depressions, or structures to be buried in place at least:
      a. Once per 400 square feet per 2 feet maximum of vertical lift for each different material installed.
   9. Twenty additional in-place compaction tests at the discretion of the Engineer.
   10. Maximum density of material containing more than 30% oversize (greater than ¾" diameter) cannot be determined by use of the ASTM Designation D698. In this case, a field maximum density may be determined by a test strip method. The material shall be

compacted at or near optimum moisture content and a field density (compaction) test shall be taken after each pass of the compaction equipment. This sequence shall continue until the maximum field density is achieved. This maximum field density shall be used for subsequent field compaction tests. Enough density tests should be taken to monitor proper compaction.

E. Proof roll compacted fill surfaces under slabs-on-grade, paving and foundations with fully loaded heavy equipment (loader or haul truck) supplied by the Contractor at the request of the Engineer. Remove and repair areas of unstable material when requested by Engineer.

F. When tests indicate Work does not meet specified requirements, remove Work, replace and retest at no additional cost to the Owner.

3.8 PROTECTION OF FINISHED WORK

A. Section 01 73 40 - Execution: Protection of installed construction.

B. Reshape and re-compact fills subjected to vehicular traffic.

3.9 SCHEDULE

A. Slabs-On-Grade:
   1. Fill Type granular or structural, minimum of 6-inches thick, compacted to 95 percent of maximum density as determined by ASTM D698 (Standard Proctor).
   2. Cover with Imported Aggregate Base Course, 6-inches thick, compact uniformly to 98% percent of maximum density as determined by ASTM D698 (Standard Proctor).

B. Exterior Side of Foundation and Retaining Walls:
   1. Fill Type S1(Select Fill) or S2(Landscaping Fill) as specified in the drawings to subgrade elevation. 6-inch thick each lift, compact uniformly Type S1 material to 95% and Type S2 to 90% percent of maximum density as determined by ASTM D698 (Standard Proctor).

C. Fill for Abandoned Structures and Depressions Resulting from Demolition Work:
   1. Fill Type S1(Select Fill) to subgrade elevation.
   2. Moisture condition backfill, place in uniform lifts not to exceed 8-inches and compact to 92% maximum density as determined by ASTM D698.

D. Underground Tanks: Backfill in accordance with Slabs-On-Grade including Exterior Side and Foundation Walls above.

E. Fill For Berming:
   1. Fill Type S2 (Landscaping), to 6-inches below finish grade, compact uniformly to 85% of maximum density as determined by ASTM D698 (Standard Proctor).

F. Geotextile Separation Fabric, furnish and install in accordance with the drawings.
   1. Aggregates for Drains : Grading A
   2. Separation Fabric as described in Article 2.2 “Accessories” above. Install in accordance the drawings and manufacturer’s recommendations.

G. Fill Under Asphalt and Concrete Paving:
   1. Compact subsoil to 95 percent of its maximum dry density as determined by ASTM D698 (Standard Proctor).
   2. Geotextile fabric.
   3. Fill Type Structural (pit-run), minimum of 12-inches thick, compacted to 95 percent of maximum density.
   4. Imported or Reclaimed Aggregate Base Course – Grading H or W to 6 inches below finish paving elevation, compact uniformly to 95% percent of maximum density as determined by ASTM D698 (Standard Proctor).

H. Fill to Correct Over-excavation or excavation under existing slabs:
   1. Flowable Fill shall be used when adequate compaction cannot be achieved under pipes or building element (slabs, footers, etc). Comply with Section 31 23 24. Install in locations described in the drawings, or as required by the Engineer.
   2. Fill Granular or Pit Run to 18 inches below bottom of base course or pipe bedding and flush to required elevation, compact uniformly to 95% percent of maximum density as determined by ASTM D698 (Standard Proctor).

I. Embankments:
   1. Soil Type S5 – Embankment Material supporting roads, sidewalks and other structures, 6-inch maximum lifts, compact uniformly to 95% percent of maximum density as determined by ASTM D698 (Standard Proctor).
   2. Soil Type S5 – Embankment Material not supporting roads, sidewalks for structures, 6-inch maximum lifts, compact uniformly to 90% percent of maximum density as determined by ASTM D698 (Standard Proctor).

END OF SECTION 31 23 23

SECTION 31 23 24 - FLOWABLE FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Flowable fill for:
      a. Structure backfill.
      b. Utility bedding.
      c. Utility backfill.
      d. Filling abandoned utilities.

B. Related Sections:
   1. Section 31 23 16 - Excavation: General building excavation.
   2. Section 31 23 17 - Trenching: Soil and aggregate backfill for utility trenches.
   3. Section 31 23 23 - Fill: Correction of over-excavations.
   4. Section 32 91 19.13 – Topsoil Placement and Grading: Filling of topsoil over backfilled trenches to finish grade elevation.
   5. Division 33 – Buried Utilities.

1.2 DEFINITIONS

A. Utility: Any buried pipe, duct, conduit, manhole, vault, tank, or cable.

B. Excavatable Flowable Fill: Lean cement concrete fill used where future excavation may be required, such as fill for utility trenches, bridge abutments, and culverts.

C. Non-excavatable Flowable Fill: Lean cement concrete fill used where future excavation is not anticipated, such as fill below structure foundations and filling abandoned utilities.

1.3 REFERENCE STANDARDS

A. ASTM International:
   1. ASTM C33 - Standard Specification for Concrete Aggregates.
   2. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
   3. ASTM C150 - Standard Specification for Portland Cement.
   4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   5. ASTM C403/C403M - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
   6. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
   7. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
   8. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
   9. ASTM C1040 - Standard Test Methods for Density of Unhardened and Hardened Concrete in Place By Nuclear Methods.

10. ASTM D4832 - Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

C. Field Quality-Control Submittals:
   1. Mix Design:
      a. Furnish flowable fill mix design for each specified strength.
      b. Furnish separate mix designs when admixtures are require for the following:
         1) Flowable fill Work during hot and cold weather.
         2) Air entrained flowable fill Work.
      c. Identify design mix ingredients, proportions, properties, admixtures, and tests.
   2. Furnish test results to certify flowable fill mix design properties meet or exceed specified requirements.

D. Qualifications Statements:
   1. Submit qualifications for supplier.

1.5 QUALITY ASSURANCE

A. Perform Work according to State standards and authorities having jurisdiction (AHJ’s).

1.6 QUALIFICATIONS

A. Supplier:
   1. Company specializing in supplying products specified in this Section with minimum three years' experience.
   2. Product source approved by AHJ’s.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls specifies ambient condition control facilities for product storage and installation.

B. Minimum Conditions: Do not install flowable fill during inclement weather or when ambient temperature is less than 40 degrees F.

1.8 FIELD MEASUREMENTS

A. Verify field measurements before installing flowable fill to establish quantities required to complete the Work.

PART 2 PRODUCTS

2.1 FLOWABLE FILL

A. Flowable Fill: Excavatable type and non-excavatable type.

2.2 MATERIALS

A. Portland Cement: ASTM C150 Type II or Type V.

B. Coarse Aggregate: AASHTO Size No. 57

C. Fine Aggregates: ASTM C33.

D. Water: Clean and not detrimental to concrete.

2.3 ADMIXTURES

A. Manufacturers:
   1. BASF Corporation, Cortex Corporation or equal.

B. Air Entrainment: ASTM C260.

C. Chemical Admixture: ASTM C494/C494M.

D. Fly Ash: ASTM C618 Class C or F obtained from residue of electric generating plant using ground or powdered coal.

E. Plasticizing: ASTM C1017/C1017M Type I, plasticizing.

2.4 MIXES

A. Mix and deliver flowable fill according to ASTM C94/C94M, Option C.

B. Flowable Fill Design Mix:

ITEM	EXCAVATABLE	NON-EXCAVATABLE
Cement Content	45 lb/cu yd	100 to 150 lb/cu yd
Fly Ash Content	None	150-600 pcf
Water Content	45 gal/cu yd (or as needed)	45 gal/cu yd (or as needed)
Air Entrainment	5 to 15 percent	5 to 15 percent
28-Day Compressive Strength	Maximum 60 psi.	Minimum 125 psi
Unit Mass (Wet)	80 to 110 pcf	100 to 125 pcf
Temperature, Minimum at Point of Delivery	50 degrees F	50 degrees F

C. Provide water content in design mix to produce self-leveling, flowable fill material at time of placement.

D. Design mix air entrainment and unit mass are for laboratory design mix and source quality control only.

2.5 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing, inspection and analysis requirements.

B. Test and analyze properties of flowable fill design mix and certify results for the following:
   1. Design mix proportions by weight of each material.
   2. Aggregate: ASTM C33 and AASHTO No. 75 for material properties and gradation.
   3. Properties of plastic flowable fill design mix including:
      a. Temperature.
      b. Slump.
      c. Air entrainment.
      d. Wet unit mass.
      e. Yield.
      f. Cement factor.
   4. Properties of hardened flowable fill design mix including:
      a. Compressive strength at 1 day, 7 days, and 28 days. Report compressive strength of each specimen and average specimen compressive strength.
      b. Unit mass for each specimen and average specimen unit mass at time of compressive strength testing.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination: Verification of existing conditions before starting Work.

B. Verify excavation specified in Section 31 23 16 and trenching specified in Section 31 23 17 is complete.

C. Verify utility installation as specified in Division 33 is complete and tested before placing flowable fill.

D. Verify excavation is dry and dewatering system(s) is operating.

3.2 PREPARATION

A. Section 01 73 40 - Execution: Requirements for installation preparation.

B. Support and restrain utilities to prevent movement and flotation during installation of flowable fill.

C. Protect structures and utilities from damage caused by hydraulic pressure of flowable fill before fill hardens.

D. Protect utilities and foundation drains to prevent intrusion of flowable fill.

3.3 INSTALLATION - FILL, BEDDING, AND BACKFILL

A. Place excavatable type and non-excavatable type flowable fill as directed by the Engineer. In general:
   1. Place excavatable-type flowable fill around buried utility lines and equipment.
   2. Place non-excavatable-type flowable fill under building slabs and areas where future maintenance/access is not anticipated.

B. Place flowable fill by chute, pumping or other methods approved by the Engineer.
   1. When required, place flowable fill under water using tremie procedure.
   2. Do not place flowable fill through flowing water.

C. Place flowable fill in lifts to prevent lateral pressures from exceeding structural capacity of structures and utilities.

D. Place flowable fill evenly on both sides of utilities to maintain alignment.

E. Place flowable fill to elevations indicated on Drawings without vibration or other means of compaction.

3.4 INSTALLATION - FILLING ABANDONED UTILITIES

A. Verify pipes and conduits are not clogged and are sufficiently empty to permit gravity installation of flowable fill for entire length indicated to be filled.

B. Seal lower end of pipes and conduits by method to contain flowable fill and to vent trapped air caused by filling operations.

C. Place flowable fill using method to ensure there are no voids.
   1. Fill pipes and conduits from high end.
   2. Fill manholes, tanks, and other structures from grade level access points.

D. After filling pipes and conduits seal both ends.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Perform inspection and testing according to ASTM C94/C94M (by Owner).
   1. Take samples for tests for every 20 cu yd of flowable fill, or fraction thereof, installed each day.
   2. Sample, prepare and test four compressive strength test cylinders according to ASTM D4832. Test one specimen at 3 days, one at 7 days, and two at 28 days.
   3. Measure temperature at point of delivery when samples are prepared.

C. Perform in-place density tests using nuclear test device according to ASTM C1040 (by Owner).
   1. Perform tests at locations as directed by Engineer.

D. Defective Flowable Fill: Fill failing to meet the following test requirements or fill delivered without the following documentation.
   1. Test Requirements:
      a. Minimum temperature at point of delivery.
      b. Compressive strength requirements for each type of fill.
   2. Documentation: Duplicate delivery tickets.

3.6 CLEANING

A. Perform washout of concrete-based mixtures in designated areas in accordance with Section 01 50 00 – Temporary Facilities and Controls.

B. Remove spilled and excess flowable fill from Project Site.

C. Restore facilities and Site areas damaged or contaminated by flowable fill installation to existing condition before installation.

END OF SECTION 31 23 24

SECTION 32 12 16 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Hot-mix asphalt patching.
   2. Hot-mix asphalt paving.
   3. Hot-mix asphalt overlay.
   4. Asphalt surface treatments.

B. Contractor shall comply with requirements of hot-mix asphalt patching and paving for this Project. Requirements for hot-mix asphalt overlays and surface treatments may be required by the Engineer when applicable.

C. Related Sections:

   1. Section 31 10 00 – Site Clearing: Milling and reuse and/or recycling of asphalt pavement.
   2. Section 31 23 17 – Trenching: For installation of utilities within paved areas.
   3. Section 31 23 23 – Fill: For subgrade preparation and fill material including aggregate base course.

1.3 REFERENCES

A. Asphaltic Institute (AI) MS2-94 - Mix Design Method/Asphalt Concrete/Hot Mix Types

B. ASTM C29/C29M-97 - Standard Test Method for Bulk Density (Unit Weight) and Voids in Aggregate

C. ASTM C88-99a - Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

D. ASTM C117-95 - Standard Test Method for Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing

E. ASTM C128-97 - Standard Test Method for Specific Gravity Test and Absorption of Fine Aggregate

F. ASTM C131-96a - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

G. ASTM C136-96a - Standard Test Method for Sieve Analysis and Fine and Coarse Aggregates

H. ASTM D4-86(1998) - Standard Test Method for Bitumen Content

I. ASTM D5-97 - Standard Test Method for Penetration of Bituminous Materials

J. ASTM D70-97 - Standard Test Method for Specific Gravity and Density of Semi-Solid Bituminous Materials (Pyncometer Method)

K. ASTM D93-99b - Standard Test Method for Flash-Point by Pensky-Martens Closed Cup Tester

L. ASTM D113-99 - Standard Test Method for Ductility of Bituminous Materials

M. ASTM D290-91a - Standard Practice for Bituminous Mixing Plant Inspection

N. ASTM D692-94a - Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures

O. ASTM D946-82(1999) - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction

P. ASTM D977-98 - Standard Specification for Emulsified Asphalt

Q. ASTM D995-95b - Standard Specification for Mixing Plants for Hot Mixed, Hot Laid Bituminous Paving Mixtures

R. ASTM D1073-94 - Standard Specification for Fine Aggregate for Bituminous Paving Mixtures

S. ASTM D1188-96e1 - Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens

T. ASTM D2026-97 - Standard Specification for Cutback Asphalt (Slow-Curing Type)

U. ASTM D2027-97 - Standard Specification for Cutback Asphalt (Medium-Curing Type) AASHTO M82)

V. ASTM D2028-97 - Standard Specification for Cutback Asphalt (Rapid-Curing Type)

W. ASTM D2041-95 - Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

X. ASTM D2170-95 - Standard Test Method for Kinematic Viscosity of Asphalts (Bitumens)

Y. ASTM D2172-95 - Standard Test Method for Quantities Extraction of Bitumens from Bituminous Paving Mixtures

Z. ASTM D2419-95 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.

AA. CTSS 26.102 - Caltrans Standard Specifications, Aggregate Bases, Class 2 Aggregate Base

BB. CTSS 39.202 - Caltrans Standard Specifications, Asphalt Concrete Aggregate

1.4 ACTION SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: For each type of product.
   1. Include technical data and tested physical and performance properties.
   2. Job-Mix Designs: For each job mix proposed for the Work.

C. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:
   1. Paving Fabric: 12 by 12 inches minimum.

1.5 INFORMATIONAL SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Qualification Data: For manufacturer and testing agency.

C. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

D. Material Test Reports: For each paving material, by a qualified testing agency.
   1. Coarse and fine aggregate from each material source and each required grading:
      a. Sieve analysis: ASTM C136-96a (AASHTO T19)
      b. Unit weight of slag: ASTM C29/C29M-97 (AASHTO T19)
      c. Soundness: ASTM C88-99a (AASHTO T104)
      d. Sand equivalent: ASTM D2419-95 (AASHTO T176)
      e. Abrasion of coarse aggregate: ASTM C131-96 (AASHTO T96)
   2. Asphalt cement for each penetration grade:
      a. Penetration: ASTM D5-97 (AASHTO T49)
      b. Viscosity (Kinematic): ASTM D2170-95 (AASHTO T201)
      c. Flash Point: ASTM D93-99b (AASHTO T48)
      d. Ductility: ASTM D113-99 (AASHTO T51)
      e. Solubility: ASTM D4-86(1998) (AASHTO T44)
      f. Specific gravity: ASTM D70-97 (AASHTO T43)
   3. Job-mix design mixtures for each material or grade:
      a. Bulk specific gravity for fine aggregate: ASTM C128-97 (AASHTO T84)
   4. Uncompacted asphalt concrete mix: Maximum specific gravity ASTM D2041-95 (AASHTO T209)
   5. Compacted asphalt concrete mix:
      a. Bulk density: ASTM D1188-96e1 (AASHTO T166)
   6. Density and void analysis:
      a. Provide each series of asphalt concrete mixture test specimens, in accordance with AI MS2-94
      b. Use Marshall method of mix design unless otherwise directed or acceptable to Engineer.
   7. Sampling and testing of asphalt concrete mixtures for quality control during paving operations:
      a. Uncompacted asphalt concrete mix:
         1) Asphalt cement content: ASTM D2172-95 (AASHTO T164)

2) Penetration of recovered asphalt cement: ASTM D5-97 (AASHTO T49)
3) Ductibility of recovered asphalt cement: ASTM D113-99 (AASHTO T51)

b. Compacted asphalt concrete mix:
1) Bulk density: ASTM D1188-96e1 (AASHTO T166)
2) Perform at least one test for each day's paving
3) Asphalt plant inspection: ASTM D290-91a

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction (AHJ) or the DOT of state in which Project is located.

B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated.

C. Testing required for determining compliance with the Work of this section will be the responsibility of the Contractor. Field density and temperature testing will be provided by Owner.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 45 deg F.
2. Tack Coat: Minimum surface temperature of 45 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 45 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 50 deg F at time of placement.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle materials under provisions of Section 01 67 00 – Product requirements.

B. Transport mixture from mix plant in trucks with tight, clean, non-sticking compartments. Coat hauling compartments with lime-water mixture to prevent sticking. Elevate and drain compartment of excess solution before loading mix.

C. Cover to protect from weather and prevent loss of heat when temperature is below 50 degrees Fahrenheit.

D. Provide insulated truck beds during temperature below 50 degrees Fahrenheit on long distance deliveries.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692-94a, sound; angular crushed stone, slag or gravel.

C. Fine Aggregate: ASTM D 1073-94, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
   1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Percent wear: ASTM C131-96, less than 45 for aggregates retained in #10 sieve.

E. Mineral Filler: ASTM D 242/D 242M rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320, PG 58-34, performance graded asphalt binder with 0.5% anti-strip agent.
   1. Binder shall conform to Section 804 – 'Asphalt Materials" of the 2010 Wyoming Department of Transportation Standard Specifications for Roads and Bridge Construction.
   2. Alternate asphalt binder having a higher upper specification temperature and/or lower specification temperature will be acceptable provided the Contractor provides written notice to the Engineer prior to production.

B. Emulsified Asphalt Prime Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

C. Tack Coat: ASTM D 977-98 emulsified asphalt, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

D. Fog Seal: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
   1. Use emulsions SS-1h or CSS-1H.

E. Water: Potable.

F. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Sand: ASTM D 1073, Grade No. 2 or No. 3.

C. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

D. Joint Sealant: ASTM D 6690, Type IV, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

A. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

B. Determine full depth design mix based upon aggregates furnished:
   1. Test mix by independent laboratory at Contractor's expense.
   2. Grade dependent on temperature during placement.
   3. Submit mix designs under provisions of Section 01 33 23 – Submittal Procedures, for review and acceptance by the Engineer.

C. Recycled Content of Hot-Mix Asphalt: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent or more than 25 percent by weight.
   1. Surface Course Limit: Recycled content no more than 10 percent by weight.

D. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by the Engineer and in compliance with the following:
   1. Mix design procedures shall follow either the Marshall process (AASHTO T-245) or the Hveem process (AASHTO T-246 and T-247).
   2. Submit mix design giving unit weight and to meet following requirements prior to placement of asphalt:

Property - 50 Blow	C Mix
Marshall Stability, pounds	1600 (minimum)
Flow, 0.01 inch	8-18
Air Voids in Mix, percent	3-5
VMA, minimum percent	14

      a. Establish a single percentage passing each sieve size, a single percent of asphalt, and a mix temperature. Maintain job mixes within following percentages of design mix:

1) Aggregates:

#8 and larger	less than 8 percent
#16 to #100	less than 6 percent
#200	less than 2 percent

2) Asphalt Content — less than 0.5 percent

3) Discharge Mix Temp. — 20 degrees Fahrenheit or higher

E. Emulsified-Asphalt Slurry: ASTM D 3910, Type 2.

PART 3 - EXECUTION

3.1 PREPARATION

A. Unauthorized removal and replacement of paved surfaces in excess of quantities indicated in the drawings and/or established in the field by the Engineer will be done so at Contractor's expense.

B. Prepare subgrade under provisions of Section 31 23 23 – Fill, and in accordance with details in the plans.

3.2 EXAMINATION

A. Verify that the subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with fully loaded heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction and, repeat proof-rolling in direction perpendicular to first direction if required by Engineer. Limit vehicle speed to 3 mph.
2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by the Engineer, and replace with compacted backfill or fill according to Section 31 23 23 – Fill, or as directed.

C. Complete pre-paving inspection in accordance with the Field Quality Control requirements of this specification.

D. Proceed with paving only after unsatisfactory conditions have been corrected. Engineer's approval of final grades is required prior to paving work.

3.3 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base according to Section 31 10 00 – Site Clearing.

1. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated.
2. Cut excavation faces vertically.
3. Remove excavated material.
4. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt and concrete surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd.
1. Clean vertical surfaces with mechanical sweeper, blowers, or hand brooms, until surfaces are free from dust.
2. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
3. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
4. Where asphaltic concrete will adhere to surface, tack coat may be eliminated by Engineer.

C. Placing Patch Material: For excavated pavement areas, 3 inches or less in depth, fill with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

D. Placing Patch Material (multiple lifts): For excavated pavement areas, 3 inches or more in depth, partially fill excavated pavements with hot-mix asphalt base mix to a compacted depth of half the excavation depth, and while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.4 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.5 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving. Clean surface with mechanical sweeper, blowers, or hand brooms, until surfaces are free from dust.

B. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.20 to 0.50 gal./sq. yd. per inch depth.

1. Adjust spray nozzles and spray bar to provide uniform application of prime coat. Cease immediately upon clogging or interference of any nozzle and correct before application is resumed.
2. Do not exceed 130 degrees Fahrenheit.
3. Apply enough material to penetrate and seal, but not flood, surface.
4. Allow prime coat to cure. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
5. Protect primed substrate from damage until ready to receive paving.
6. Protect adjacent surfaces from prime coat material.

C. Tack Coat: Comply with requirements in Article 3.3 “Patching”.

3.6 PAVING GEOTEXTILE INSTALLATION

A. Apply asphalt binder uniformly to existing pavement surfaces at a rate of 0.20 to 0.50 gal./sq. yd.

B. Place paving geotextile promptly according to manufacturer's written instructions. Broom or roll geotextile smooth and free of wrinkles and folds. Overlap longitudinal joints 4 inches and transverse joints 6 inches.

C. Protect paving geotextile from traffic and other damage, and place hot-mix asphalt overlay the same day.

3.7 PREPARING THE MIXTURE

A. Comply with ASTM D995-95b for material storage, control, and mixing and for plant equipment and operation.

B. Stockpile:
1. Keep each component of the various sized combined aggregates in separate stockpiles.
2. Maintain stockpiles so that separate aggregate sizes will not be intermixed and to prevent segregation.

C. Heating:
1. Heat the asphalt cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture.
2. Use lowest possible temperature to suite temperature viscosity characteristics of asphalt.
3. Do not exceed 350 degrees Fahrenheit.

E. Aggregate:
1. Heat-dry aggregates to acceptable moisture content.
2. Deliver to mixer at recommended temperature to suite penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture.
3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements.

E. Mix aggregate and asphalt cement to achieve 90 to 95 percent coated particles.

3.8 EQUIPMENT

A. Bituminous Pavers: Self-propelled, spreads without tearing surfaces, and controls pavement edges to true lines without use of stationary forms.

B. Rolling Equipment:
   1. Steel-wheel roller: Self-propelled, contact pressure of 250 to 350 psi per inch of width of roller wheel, equipped with adjustable scrapers and means for keeping wheel wet to prevent mix from sticking.
   2. Pneumatic-tired rollers: Self-propelled, contact pressure under each tire of 85 to 110 psi, wheels spaced so that one pass will accomplish one complete coverage equal to rolling width of machine, oscillating wheels. Remove and replace immediately tires picking up fines.

C. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools.

3.9 PLACING HOT-MIX ASPHALT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated, not to exceed 2 inches per lift.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at a minimum temperature of 250 deg F.
   4. Conform to the grade, cross-section, finish thickness, and density indicated.

B. Place paving in consecutive strips not less than 8 feet wide, unless infill edge strips of a lesser width are required.
   1. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
   3. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
   4. Complete a section of asphalt base course before placing asphalt surface course.
   5. Place mixture in continuous operation as practicable.

C. Hand Placing:
   1. Inaccessible and small areas may be placed by hand.
   2. Spread, tamp, and finish mixing using hand tools in areas where machine spreading is not possible.
   3. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature.

D. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

E. Replace painted markings subsequent to asphalt placement in accordance with Section 32 17 23 – Pavement Markings. In areas of asphalt patching, apply paint in the same pre-construction locations.

3.10 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of new or existing hot-mix asphalt course.
   1. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
   5. When the edges of longitudinal joints are irregular, honeycombed or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.
   6. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   7. Compact asphalt at joints to a density within 2 percent of specified course density.

3.11 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement.
   1. Provide pneumatic and steel-wheel type rollers to obtain the required pavement density, surface texture and ride ability.
   2. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   3. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.
   4. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge.
   1. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness.
   2. Operate rollers as close as possible to paver without causing pavement displacement.
   3. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density.
   1. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
      a. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.

D. Finish Rolling: Finish roll paved surfaces while the mixture is still warm to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness. Repair paved areas in accordance with Article 3.3, “Patching”.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.12 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated in the drawings and within the following tolerances:

   1. Base Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Remove and replace paving less than minimum thickness.

C. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

   1. Base Course: 1/4 inch
   2. Surface Course: 1/4 inch
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

D. Pockets or depressions where water may pool are not acceptable. Remove and replace areas, deficient in smoothness. Overlay corrections may be permitted only if acceptable to the Engineer.

3.13 SURFACE TREATMENTS

A. Fog Seals: Apply fog seal at a rate of 0.10 to 0.15 gal./sq. yd. to existing asphalt pavement and allow to cure. With fine sand, lightly dust areas receiving excess fog seal.

B. Slurry Seals: Apply slurry coat in a uniform thickness according to ASTM D 3910 and allow to cure.

1. Roll slurry seal when slurry thickness exceeds 1/4 inch to remove ridges and provide a uniform, smooth surface.

3.14 FIELD QUALITY CONTROL

A. Pre-Paving Inspection: During site preparation, inspect layout, slope and base course for compliance with accessibility requirements.
1. Perform spot checks of sub-base at locations critical to accessibility.
2. Verify that gradients and transitions at adjoining paving areas (where dissimilar materials meet) will allow accessible finishing.
3. Identify obstacles, inconsistencies and non-compliant items on Report.
4. Rectify problems like slopes, drains, utility hatch/valve covers, sign posts and miscellaneous items that will detract from or interfere with seamless finishing of paving.
5. Proceed with paving only after unsatisfactory conditions have been corrected and with Engineer approval.

B. Testing Agency: Services for field density testing of subgrade and asphalt with nuclear gauge (ASTM D 2950) will be provided by Owner. Contractor shall coordinate paving operations with Engineer to ensure testing agency is available prior to and during paving operations.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Testing agency will take samples of un-compacted paving mixtures and compacted pavement according to ASTM D 979.
1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    a. When requested by Engineer, one core sample will be taken for every 500 sq. yd. or less of installed pavement, with no fewer than three cores taken.
    b. Field density of in-place compacted pavement shall be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
        1) Record measurements every 200 sq. yd. of installed pavement.
        2) Document locations of measurements according to waterline stationing.
        3) Submit test reports to the Engineer.

F. Replace and compact hot-mix asphalt where core tests were taken.

G. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.15 CLEANING AND WASTE HANDLING

A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of Engineer.

B. General: Remove and dispose of legally asphalt-paving waste offsite.

END OF SECTION 32 12 16

SECTION 32 80 00 – LANDSCAPE IRRIGATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Contract Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for furnishing and installation of landscaping irrigation as outlined in these Specifications until Final Acceptance.

B. Contractor shall furnish all labor, materials, supplies, equipment, tools and transportation, and perform all operations in connection with and reasonably incidental to the complete installation and/or repair of existing irrigation systems, the guarantee/warranty, the installation details, and all other requirements specified herein. This shall include removal and caping and abandonment of existing irrigation, repair to existing landscape irrigation systems for all areas disturbed by construction, and installation of new irrigation to ensure new sod and planting areas will receive adequate water. Complete irrigation coverage of all turf areas and irrigation of all planting areas shall be performed using equipment similar to that existing onsite. Items of Work specifically included are:

1. Procuring all applicable licenses, permits, and fees.
2. Inspecting Work site prior to construction and ascertaining utility locations.
3. Connection to water supply points.
4. Installing irrigation system, including pipe, valves, boxes, filters, flushing points, sleeving, and other appurtenances – new and salvaged.
5. Connecting electrical power supply to the irrigation control system.
6. Programming, flushing, commissioning and testing of the system.
7. Ensuring that the system is fully functioning.
8. Maintaining system until final acceptance.
9. Provide ‘as constructed’ drawings.

C. Related Sections:
1. Section 31 05 13 – Soils for Earthwork: Topsoil
2. Section 32 91 19.13 – Topsoil Placement & Grading
3. Section 32 80 00 – Landscape Irrigation
4. Section 32 92 19.16 – Hydraulic Seeding
5. Section 32 92 23 – Sodding

6. Section 32 93 00 – Plantings: Trees & Shrubs

1.3 GENERAL

A. Contractor shall inspect existing irrigation systems at the Project site where the Work is to be performed and become aware of pre-construction locations of irrigation equipment and controls, the ground structure, obstacles which may be encountered during and post-construction, and all other relevant matters in connection with the Work prior to the to project bid. Contractor shall contact the Town's Parks and Recreation offices for any questions, or arrange onsite meeting for inspection.

B. Contractor is expected to base the Bid on equipment and materials compatible with the existing irrigation system. In the event there are materials and/or equipment in the Bid which do not conform with this Section, Contractor shall be responsible for furnishing and installing approved materials and equipment at no additional cost to Owner.

C. Substitutions for equipment shall be pre-approved by Engineer.

D. Precautions have been taken to ensure accuracy and conformance of the Contract Documents with the design concept of the Project. Nevertheless, Contractor shall be responsible for confirming and correlating actual job site dimensions, for acquiring information that pertains solely to the fabrication process or to techniques of construction, and for coordinating the Work with all other trades.

E. Beginning Work of this section implies acceptance of existing conditions. There shall be no extra compensation by reason of any matter or thing concerning conditions about which Contractor may be informed prior to bidding.

1.4 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. International Association of Plumbing and Mechanical Officials (IAPMO).

2. National Electrical Code (NEC).

3. Underwriters Laboratories, Inc. (UL).

4. Uniform Plumbing Code (UPC).

1.5 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Materials List: Include pipe, fittings, mainline components, water emission components, and control system components. Quantities of materials need not be included.

C. Manufacturer's Data: Submit manufacturer's catalog cuts, specifications, and operating instructions for equipment shown on the materials list.

D. Closeout Submittal: Provided record drawings of irrigation system, including locations of

pipe and size, location of control boxes and flushing points, valves and connection points to the existing system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall exercise care in handling, loading, and unloading the pipe and fittings. Pipe shall be stored in accordance with the manufacturer's recommendations.

1.7 GUARANTEE AND REPLACEMENT

A. The purpose of this guarantee/warranty is to ensure that Owner receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.

1. For a period of two (2) years from the date of final completion and commencement of the formal maintenance period, guarantee/warranty irrigation materials, equipment and workmanship against defects. Fill and repair depressions. Restore landscape or structural features damaged by the settlement of irrigation trenches or excavations. Repair damage to the premises caused by a defective item. Make repairs within three (3) days of notification from Engineer.

2. Guarantee/warranty applies to originally installed materials and equipment and replacements made during the guarantee/warranty period.

1.8 PROJECT CLOSEOUT

A. Provide irrigation system demonstration and training for Owner's personal upon completion in accordance with Section 01 79 00.

PART 2 PRODUCTS

2.1 GENERAL

A. Unless otherwise stipulated in the Specifications, all equipment, materials and articles incorporated in this Project are to be new and in the best grade of their respective kinds for the purpose.

B. When the Contract Documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, Contractor shall provide the quality and size required by the Contract Documents.

C. Work and materials shall be in accordance with the latest edition of the National Electrical Code, Uniform Plumbing Code as published by the Western Plumbing Officials Association, and applicable laws and regulations of the governing authorities.

2.2 PIPE, TUBE & FITTINGS

A. Mainline Pipe & Fittings: Schedule 40 PVC, ASTM D-1784 and/or ASTM D-2241, Class 200 SDR-21.

B. Lateral Line Pipe: PVC C160 SDR-26.

C. Fittings:

1. All plastic pipe fittings shall be permanently marked with the following information: Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73 deg. F (23 deg. C), and National Sanitation Foundation (N.S.F.) approval.

2. All plastic pipe fittings to be installed shall be molded fittings manufactured of the same material as the pipe and shall be suitable for solvent weld or screwed connections.

3. Slip fitting socket taper shall be so sized that a dry unsoftened pipe end, conforming to these special provisions, can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only schedule 80 fittings may be threaded.

4. When connection is plastic to metal, plastic male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon Tape and Teflon paste. No oil-based products permitted.

5. Solvent weld fittings shall be manufactured by Lasco, Spears, or acceptable equal. All lateral line fittings and mainline fittings two inches (2") (50mm) and smaller shall be schedule 40 solvent weld fittings.

2.3 MANUAL VALVES

A. All manual ball valves, sizes three-inch (3") (75mm) and smaller, shall be full ported ball valves with maximum working pressure of 175 psi (1200kPa) and 350 psi (2400kPa) hydrostatic test pressure.

B. All manual gate valves of four-inch (4") (100mm) size or larger shall be iron body, brass trimmed, double disc wedge type with integral taper seats and with non-rising stems, and shall be Mueller A-2360 resilient wedge gate valves with mechanical joints or equal accepted in advance by the City. All manual gate valves shall be 200 psi (1380kPa) rated.

2.4 VALVE BOXES

A. All remote- control valves, manual control valves, zone shut-off valves, ball valves, or globe valves unless otherwise indicated, shall be installed in valve access box of proper size as required for easy access to the valve.

B. Valve boxes shall be located within landscaped areas and coordinated with the Owner/Engineer.

2.5 SPRINKLER HEADS

A. All heads of a particular type and function in the system shall be of the same manufacture and shall be marked with the manufacturer's name and identification, in such a position that they can be identified without being removed from the system.

2.6 RISERS

A. All stationary spray heads shall have risers of high-density polyethylene plastic pipe ("funny pipe") with spiral barbed ell fittings. Minimum length of "funny pipe" shall be eighteen inches (18") (450mm).

B. All rotor pop-up sprinklers shall have an adjustable pre-assembled double swing joint riser. Swing joints shall be Lasco or Spears Marlex ells MIPT x FIPT or equal. Swing joints shall be twelve inches (12") (300mm) long and shall be threaded on both ends. The swing joint riser shall be of proper pipe size to match head threads.

2.7 MAINLINE COMPONENTS

A. Point-of-Connection (P.O.C.): Connect to existing irrigation system with valve controller.

2.8 AUTOMATIC IRRIGATION CONTROLLERS

A. Controllers: Integrate new/replaced irrigation system with existing controller(s).

2.9 PIPE SLEEVES

A. Pipe sleeves shall be Schedule 40 PVC pipe, or equal

2.10 SPRINKLER IRRIGATION COMPONENTS

A. Automatic Remote Control Valves Assembly for Sprinkler Laterals: All remote-control valves shall be two-inch (2") (50mm) Toro 216, two-inch (2") (50mm), or approved equal. Rainbird GB globe pattern, or approved equal. All valves shall be 24-volt, with epoxy sealed solenoid coils and throttling stem. All splices shall be installed with 3M DBY and DBR types and all splices shall be made inside the valve box.

B. All other materials, not specifically described, but required for a complete and proper irrigation system installation, shall be new, first quality of their respective kinds, and subject to the approval of Engineer.

2.11 PIPE SLEEVE

A. Pipe Sleeve: PVC Schedule 40.

2.12 THRUST BLOCK

A. Concrete for thrust blocks shall meet the following:

1. PSI: Minimum of three thousand five hundred (3,000).

2. Water/cement Ratio: Not greater than fifty-three hundredths (0.53).

3. Air Content: Range between four and eight percent (4-8%).

4. Slump: Maximum of four (4) inches.

2.13 CONTROL SYSTEM COMPONENTS

A. Irrigation Controller Unit: Integrate new/replaced irrigation system with existing controller.

B. Control Wire:

1. Type: Electric wire from the controller unit, to each remote control valve shall be American Wire Gauge (AWG) No. 14 solid copper, Type UF cable, UL approved for direct underground burial. Common wire shall be AWG No. 12 solid copper, Type UF cable, UL approved for underground burial.

2. All electric control and ground wire shall be irrigation control cable or approved equal, 14-gauge unless otherwise indicated on the drawings. All wiring to be used for connecting the automatic remote-control valve to the automatic controllers shall be Type "UF", 600 volt, solid copper, single conductor wire with PVC insulation and bear UL approval for direct underground burial feeder cable.

3. Insulation shall be 4/64-inch (1.6mm) thick minimum covering of ICC-100 compound for positive waterproofing protection. All control or "hot" wires shall be of one color (black) and all common or "ground" wires shall be white. When more than one valve is operated by a single controller station, provide separate control wire from the controller to each valve, and one valve per box. Each valve should have no less than twenty-four inches (24") (600mm) of control cable inside valve box. Each wire shall be labeled at the valve box and at the controller to what zone each wire controls.

4. Verification of wire types and installation procedures shall be checked to conform to local codes.

2.14 ACCESSORIES

A. Contractor shall provide to Owner operating keys, servicing tools, test equipment, other items and spare parts indicated in the General Notes on the Drawings.

PART 3 EXECUTION

3.1 GENERAL

A. Appoint a competent resident superintendent to be onsite whenever the Work is in progress. The superintendent shall not be replaced without notice to Engineer.

B. Contractor is responsible for locating and avoiding underground utilities, for notifying all appropriate agencies prior to beginning excavation, and for any damage caused by Contractor. Contractor is required to notify Engineer and the utility company should there be any damage to utilities.

C. Engineer and Owner shall at all times have access to the Work wherever it is in preparation or progress and Contractor shall provide proper facilities for such access and inspection.

D. Engineer shall have the right to reject materials and workmanship or require their correction. Any rejected or faulty Work shall be repaired or replaced at no cost to Owner.

E. Contractor shall follow the local code requirements. In the event that a discrepancy exists between these Specifications and the local codes, the adopted code shall prevail.

F. Record Drawings:

1. Contractor shall keep an up-to-date set of Drawings on the job site detailing existing and newly constructed irrigation systems.

2. After completion of the Project, Contractor shall furnish Owner with an "as-built" drawing. The "as-built" drawing shall show the correct location of all piping, valves, heads and control line locations. Instruction sheets and parts lists covering all operating equipment shall be bound in a folder and furnished to Owner.

3.2 PREPARATION

A. Contractor shall protect all existing site development including, but not limited to, existing buildings, equipment, underground utilities, walls, materials, etc. Any existing site development damaged by willful or negligent acts of Contractor or any of Contractor's employees shall be replaced or repaired at no expense to Owner and in a manner satisfactory to Engineer before Project acceptance is given. This provision applies to onsite damage as well as to that which may occur to adjacent properties.

B. Until the Project has been accepted, Contractor shall erect and maintain shoring, barricades, guards, warning signs, and lights as necessary or required for the protection of the public, the Work, and the workers. To the same ends, provide Work area safety and institute side security measures, as needed.

C. Contractor shall stake out the irrigation system. Items staked include sprinklers, pipe, control valves, manual drains, pumping plant, controller, and isolation valves. After staking out the system, Owner shall be contacted for approval before trenching.

D. Contactor shall locate where pipe sleaves are required under roadways and paths.

3.3 EXCAVATION AND BACKFILL

A. General: All excavation shall be done by open cut except where boring is permitted or required. All trenches shall be straight with bottoms on uniform slopes. The trench shall be graded along its entire length to ensure firm bedding of the pipe.

B. Excavation: Contractor shall do all necessary excavation for the proper installation of the Work. Over-excavation shall be backfilled and hand-tamped prior to installation of the pipe. Any pumping, bracing or shoring shall be included in the unit cost for excavation. Contractor shall excavate to permit the pipes to be laid at the intended elevations and to permit workspace for installing connections and fittings.

C. Minimum Cover (Distance from Top of Pipe or Control Wire to Finish Grade):

1. 36-inch minimum over mainline pipe.

2. 18-inch over lateral pipe.

3. 12-inch over lateral pipe to pop-up sprinklers.

4. 12-inch over lateral pipe to rotary sprinklers.

D. Backfill:

1. Mainline: & Lateral Piping: Install pipe with Type-1 pipe bedding in accordance with Section 31 05 16 – Aggregates for Earthwork.
2. Lateral Pipe to Pop-up Sprinklers: The material excavated from the trenching may be used for backfill when meeting the following standards. The material placed directly on top of the pipe to a depth of six (6) inches shall be free of all foreign matter and rock exceeding ¾" dia. After this, rock two (2) inches in diameter or less will be allowed in the backfill material. All rock or foreign matter not incorporated in the backfill material shall be hauled off the site at Contractor's expense. In the event clean backfill material from the excavation is insufficient, Contractor shall import clean fill material as needed.

E. Compaction. All trenches shall be compacted within the pipe area by hand-tamping or by water puddling. If water is used to compact the ditch, it shall be applied after the backfill has been brought to the top of the pipe. After the initial backfill has been properly placed and tamped around the pipe, the remaining backfill material may be placed and compacted by machine. All trenches shall be compacted to the density of the surrounding material. Special attention shall be given to traffic areas to protect the pipe and to avoid future settlement because of poor compaction. Any settlement occurring within the guarantee period shall be repaired at no additional cost to Owner.

3.4 PIPE INSTALLATION

A. General:

1. Irrigation pipe extending under paved surfaces shall be placed in a minimum 4" dia. Schedule 40 PVC pipe sleeve.

2. Replaced irrigation pipe shall match existing pipe size; necking-down of existing pipe with new pipe is not allowed.

3. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.

4. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.

B. Mainline Pipe and Fittings:

1. Threaded Plastic Pipe: Use only strap-type friction wrenches for threaded plastic pipe.

2. PVC Rubber-Gasketed Pipe: Use pipe lubricant. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.

3. PVC Solvent Weld Pipe:

   a. Use primer and solvent cement. Join pipe in a manner recommended by the manufacturer and in accordance with accepted industry practices.

   b. Cure for thirty (30) minutes before handling and twenty four (24) hours before allowing water in pipe.

   c. Snake pipe from side to side within the trench.

C. Lateral Pipe and Fittings:

1. Threaded Plastic Pipe: Use only strap-type friction wrenches for threaded plastic pipe.
2. PVC Solvent Weld Pipe:

   a. Use primer and solvent cement. Join pipe in the manner recommended by manufacturer and in accordance with accepted industry practices.

   b. Cure for thirty (30) minutes before handling and twenty-four (24) hours before allowing water in pipe.

   c. Snake pipe from side to side within the trench.

D. Permissible Deflection at Joints: Whenever it becomes necessary to deflect the pipe from a straight line in either a horizontal or vertical plane, the degree of deflection shall be within the limits set forth by the pipe manufacturer and shall be approved by Engineer.

E. Deviations for Utility Structures: Whenever existing utility structures, conduits, ducts, pipes or other obstructions to grade and alignment of the pipe are encountered, they shall be permanently supported, protected, removed, relocated or reconstructed by Contractor through the cooperation of the utility company involved.

F. Deviations for Existing Tree Roots: Avoid cutting tree roots larger than one (1) inch in diameter.

G. Thrust Blocking: All pipe, fittings, and valves shall be carefully placed in the trenches with concrete thrust blocks to be poured at all fittings that result in a change of flow direction in the main line on pipe larger than three (3) inches. Any concrete that is judged to be of inferior quality shall be replaced at Engineers's request. The thrust blocks shall be left exposed for forty eight (48) hours for inspection.

H. Sleeves: All pipe under pavement shall be in PVC Schedule 40 sleeves and shall be a minimum of 4-inch dia. or otherwise sized two (2) times the diameter of pipe being sleeved.

3.5 SPRINKLER INSTALLATION

A. General. All sprinklers shall be installed by Contractor at locations that will provide adequate coverage and watering of plantings. When required by Engineer, relocate sprinkler heads to provide adequate coverage.

B. Sprinkler Heads. All sprinkler heads shall be installed in strict accordance with the manufacturer's recommendations. Provide a swing pipe assembly for each sprinkler head. Prior to the installation of the nozzles, all piping shall be thoroughly flushed. Sprinklers shall be installed at grade.

3.6 CONTROL EQUIPMENT

A. General: Reuse, or integrate with, all existing manual and automatic control valves, automatic controllers, pressure reducing valves, check valves, vacuum breakers, and other control equipment.

B. Automatic Valves. Use brand model and size compatible with existing system. When possible, salvage existing for reuse. Automatic control valves shall be installed in accordance with the manufacturer's recommendations.

1. Relocate control valves as needed from pre- to post-construction locations. Coordinate final locations with Owner/Engineer.

2. Flush mainline before installation of remote-control valve assembly (RCV).

3. Wire connectors and waterproof sealant shall be used to connect control wires to remote control valve wires. Install connectors and sealant per the manufacturer's recommendations.

4. Adjust RCV to regulate the downstream operating pressure.

C. Irrigation Controller Unit:

1. Contractor shall reuse existing controller.

2. Install one valve output surge protection arrestor on each control wire and one for the common wire.

3. Attach wire markers to the ends of control wires inside the controller unit housing. Label wires with the identification number of the remote-control valve to which the control wire is connected. Correlate RCV numbers with record drawings.

4. Connect control wires to the corresponding controller terminal.

D. Control Wire:

1. Bundle control wire where two (2) or more are in the same trench. Bundle with pipe wrapping tape spaced at ten-foot (10') intervals.

2. Control wiring may be pulled into the soil utilizing a vibratory plow device specifically manufactured for pipe pulling. Minimum burial depth is 12" below finished grade.

3. Provide a twenty-four inch (24") excess length of wire in an eight-inch (8") diameter loop at each ninety degree (90°) change of direction, at both ends of sleeves, and at one-hundred foot (100') intervals along continuous runs of wiring. Do not tie wiring loop. Coil the twenty-four inch (24") length of wire within each remote control valve box.

4. Install common ground wire and one control wire for each remote-control valve. Multiple valves on a single control wire are not permitted. Install control wires along the entire length of the mainline. Provide a twenty-four inch (24") length of wire from each end of the spare control wires coiled in the control enclosure and provide a twenty-four inch (24") length of coiled wire for each spare control wire in a six-inch (6") round valve box at each distal end of the mainlinepipe.

5. If a control wire must be spliced, make splice with wire connectors and waterproof sealant, installed per the manufacturer's instructions. Locate splice in a valve box which contains an irrigation valve assembly, or in a separate six-inch (6") round valve box.

6. Unless noted otherwise noted on the Drawings, install wire parallel with and under PVC mainline pipe.

7. Protect wire not installed with PVC mainline pipe with a continuous run of warning tape placed in the backfill six (6) inches above the wiring.

3.7 FIELD QUALITY CONTROL

A. Major Inspections: Contractor shall obtain approval of Engineer at these points in construction before proceeding to next operation.

1. Trenching and Mainline Installation, Including Thrust Blocks: Engineer shall review thrust blocking and observe a pressure test of the mainline before any backfilling.

2. Head Layout: Engineer shall review Contractor's proposed irrigation head layout before installation of the heads.

3. Final Punch List: Engineer shall prepare a punch list at the completion of construction and observe coverage, controller, and other appropriate system functions.

B. Periodic Spot Checks:

1. Engineer may make periodic spot checks to observe the Work in progress.

2. Follow-up visits will occur as needed.

3. Check for proper operation/coverage of sprinkler system.

C. System Adjustment: Adjustment of the sprinkler heads, control systems, and performance tests shall be done by Contractor to provide Owner with a professional, complete

installation. All performance tests shall be made in the presence of Engineer. Contractor shall pay particular attention to coverage and system operation. Any areas which do not conform to designed operation requirements because of unauthorized changes or poor installation practices shall be immediately corrected by Contractor at no additional cost to Owner.

D. Acceptance:

1. Once the system is operating in conformance with these Specifications, Engineer will issue written final acceptance of the system.

2. In unusual cases, Owner may elect to accept the system even though the corrections on the final punch list have not been made by Contractor. In such cases, the cost of completing the Work will be deducted from Contractor's final payment.

3. If the system is not in acceptable condition by the end of the watering season, Contractor is responsible for winterizing the system and restarting it the following spring.

4. Engineer is not required to make partial or staged acceptances of the irrigation system.

3.8 RESURFACING

A. Irrigation pipe shall be placed under planned walking and roadway surfaces prior to repaving the entire site. Contractor shall coordinate placement of irrigation sleeves below paved surfaces prior to paving operations; removal and replacement of new pavement placed as part of the overall project for installation of irrigation piping is unacceptable.

B. In areas where it becomes necessary to remove the existing pavement on sidewalks, roads, paths or driveways, it shall be replaced by Contractor in accordance with applicable specifications, details in the plans, or in last resort replaced with similar surfacing at least equal to the quality and quantity of the original. Prior to replacement, all exposed edges shall be trimmed to a neat straight line (saw cut) to provide an unobtrusive patch.

3.9 CLEANING

A. Upon completion of Work, remove from the site all machinery, tools, excess materials, and rubbish.

END OF SECTION 32 80 00

SECTION 32 91 19.13 – TOPSOIL PLACEMENT & GRADING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. This Work consists of placing of topsoil upon constructed cut and fill slopes or in designated areas after subsoil grading operations are complete.

B. Related Sections:
   1. Section 31 05 13 – Soils for Earthwork: Topsoil material.
   2. Section 31 10 00 – Site Clearing: Topsoil stripping and stockpiling.
   3. Section 31 23 16 – Excavation.
   4. Section 31 23 17 – Trenching: Topsoil stripping.
   5. Section 31 23 23 – Fill: Backfill of subgrade.
   6. Section 32 80 00 – Landscape Irrigation
   7. Section 32 92 23 – Sodding
   8. Section 32 93 00 – Plantings: Trees & Shrubs

1.3 REFERENCES

A. The following is a list of standards which may be referenced in this section:
   1. ASTM International (ASTM):
   2. D2974, Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and other Organic Soils.
   3. D5268, Standard Specification for Topsoil Used for Landscaping Purposes.
   4. D557-91 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

1.4 DEFINITIONS

A. Finished Grades: The required final soil surface grade elevations indicated on the Drawings, or as to match pre-construction grades.

B. Flow Lines: Refer to plans for flow lines.

C. Acceptance: Wherever the terms “acceptance,” “accepted,” or “acceptable” are used herein, they mean acceptance by the Engineer in writing.

1.5 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Samples: Submit samples of topsoil and manufactured compost used for topsoil amendment.
   1. Include source and manufacturer information.
   2. Weed free certification.
   3. Allow at least three (3) weeks for submittal approval.
   4. Comply with Section 31 05 13 – Soils for Earthwork.

C. Product Data: For all products specified.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements**.**

E. Weed-free certification for all products and materials.

1.6 QUALITY ASSURANCE

A. Furnish imported topsoil from the same approved source throughout the Work.

B. Perform Work in accordance with authorities having jurisdiction (AHJ's).

C. All imported materials shall be certified weed-free.

1.7 DELIVERY, STORAGE AND HANDLING

A. Topsoil shall be stripped and stockpiled in accordance with Sections 31 10 00 – Site Clearing.

B. Storage and handling of imported topsoil shall be completed in a similar manner as native topsoil.

1.8 SITE CONDITIONS

A. Environmental Requirements:
   1. Do not work soil when moisture content is so great that excessive compaction will occur, when it is muddy, when it is so dry that dust will form in the air, or when clods will not break readily and when it is frozen.
   2. Apply water, if necessary, to bring soil to an optimum moisture content for grading.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Comply with requirements of Section 31 05 13 – Soils for Earthwork.

B. In general, use native topsoil previously stripped and stockpiled under this Contract. Contractor shall be responsible for estimating quantity of stockpiled topsoil available on-site for reclamation Work.

C. If native topsoil is inadequate in quantity or quality, or both, obtain additional topsoil Type S4 in accordance with Section 31 05 13 – Soils for Earthwork. Costs associated with imported topsoil shall be borne by Contractor.

PART 3 - EXECUTION

3.1 EXAMINATION

A. General: Examine site and verify that conditions are suitable for finish grading Work, and that no defects or errors are present which would interfere with or cause incorrect finish grading Work to occur. Contractor shall advise Engineer, in writing, of any conditions or defects encountered on site before or during construction upon which the work of this section depends and which may adversely affect its performance.

B. Notification of Unsuitable Conditions: Before proceeding with Work, notify Engineer of unsuitable conditions, discrepancies, or conflicts. Do not commence work until unsuitable conditions or defects have been evaluated by the Engineer and corrective measures have been taken.

C. Soil Preparation: Verify that subsoil preparation Work is complete prior to commencing with topsoil placement.

3.2 PREPARATION

A. Existing Conditions:
   1. Comply with requirements specified in Section 01 73 40 – Execution, for locating and verifying existing utilities.
   2. Inspect and verify that rough subgrade preparation and elevations conform to Section 31 23 23 – Fill, before proceeding with Work of this section.

B. Protection of Existing Conditions:
   1. Use every possible precaution to prevent damage to existing conditions to remain such as structures, utilities, irrigation systems, plant materials and paving on or adjacent to the site of the Work.
   2. Provide barricades, fences or other barriers to protect existing conditions to remain from damage during construction.
   3. Do not store materials or equipment, permit burning, or operate or park equipment under the branches of existing plants to remain.
   4. Submit written notification of conditions damaged during construction to the Engineer.

C. Topsoil shall be keyed to the underlying material by scarifying the top 8 inches of subgrade. Remove materials larger than 3 inches from the subsoil surface prior to topsoil placement.

D. Do not place topsoil on surfaces without prior approval from the Engineer.

E. Prior to placement of topsoil, screen topsoil to remove material that is larger than 3 inches in any direction.

3.3 FIELD ENGINEERING

A. General:
   1. Establish lines and levels, locate, and lay out by instrumentation and similar appropriate means for planting area finish grades.
   2. Provide grade stakes and string lines to achieve smooth finish grades with positive surface drainage acceptable to the Engineer.

B. Swale Flow Lines, Bottom of Slopes, Top of Slopes and Grade Breaks: Install grade stakes at maximum 20 feet on center.

C. High Points and Low Points: Provide grade stakes at high points and low points including top of berms, catch basin rims and area drain rims.

3.4 TOPSOIL PLACEMENT AND GRADING

A. Placement:
   1. Conditions: Do not place topsoil when either the topsoil or subgrade are frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading.
   2. Where possible, promptly re-distribute stripped topsoil and vegetation so that plants will reestablish and limit the opportunity for exotic invasive species to propagate.
   3. Distribution:
      a. Distribution of topsoil shall be ecologically specific. Stripped and stockpile topsoil shall be distributed according to the dominate habitat (sagebrush, lodgepole, wetland, etc.) from which they originated. Placement of topsoil in as near to its original location will help preserve microorganisms and seeds of native plants.
      b. Uniformly distribute topsoil in a loose condition over de-compacted subsoil areas to provide an effective rooting medium.
      c. Topsoil shall have a thickness of 3 to 6 inches after natural settlement.

B. After the topsoil has been spread, large stiff clods, stones, or other foreign material that would seriously affect the effectiveness or appearance of the topsoil, shall be raked up and removed from the area.

C. Grading:
   1. Complete final topsoil grading to:
      a. The designated lines and grades as shown in the plans, or
      b. To match adjoining surface elevations and profiles.
   2. Grade soil surface with smooth uniform slope between points where elevations are given.
   3. Unless indicated otherwise, slope finish grades to drain surface water away from buildings, walks, paving, and other structures.
   4. Slope finish grades to drain surface water to catch basins, area drains, and along indicated flow lines.

5. Grade soil surface smooth to be free of high and low areas that may inhibit surface drainage.
6. Do not cover or slope finish grades toward valve covers, manholes, vaults, pull boxes, hand holes, or any other surface feature or structure utilized by the Owner, or neighboring property owners.
7. Cut smooth falls to catch basin rim, finish flush.
8. Provide smooth transitions at top and bottom of slopes.
9. Hand rake areas inaccessible to machine grading.

D. Excessive Compaction:
1. Take precautions and use appropriate equipment to prevent topsoil and subgrade compaction.
2. Topsoil shall be loosely placed and free of any compaction from spreading or handling equipment including pickups, heavy equipment, etc., for the full depth.
3. Scarify and re-grade areas showing any visible compaction from spreading or handling equipment.

E. Equipment: Use equipment of appropriate size and type to achieve the profiles and smooth soil surface free of high areas, depressions and equipment tracks.

F. Depressions and Loose Material: Fill and compact any depressions, and remove loose material to finish surface true to line and grade, presenting a smooth, compacted, and unyielding surface.

3.5 TOLERANCES

A. Hand Graded Areas:
1. Grade to within 0.08 foot of grades indicated on the Drawings, except bring soil edge surface grades, paving, curbs, and other structures to within 0.01 foot of grades shown on the Drawings.
2. Transition soil edge surface grades along paving, curbs and other structures to areas of less strict tolerance over 10 feet distance.

B. Machine Graded Areas: Grade to within 0.08 foot of grades indicated on the Drawings.

C. Allowances: Make proper allowances for settlement.

3.7 MAINTENANCE

A. Employ erosion and sediment control practices as necessary to prevent soil erosion.
1. Install erosion control measure immediately after placing topsoil. Comply with details in the plans.

3.6 FIELD QUALITY CONTROL

A. Aesthetic Acceptance of Grades:
1. Upon completion of finish grading Work, schedule with Engineer a review to obtain aesthetic acceptance. Provide five-days advance written notification.

END OF SECTION 32 91 19.13

SECTION 32 92 23 – SODDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Contract Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for furnishing and installation of bluegrass sod, and establishment of sodded areas to be achieved as outlined in these Specifications until Final Acceptance.

B. Related Sections:
   1. Section 31 05 13 – Soils for Earthwork: Topsoil
   2. Section 32 91 19.13 – Topsoil Placement & Grading
   3. Section 32 80 00 – Landscape Irrigation
   4. Section 32 93 00 – Plantings: Trees & Shrubs

1.3 DEFINITIONS

A. Finished Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, pesticides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, herbicide, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

E. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

F. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

G. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.

H. Weeds: Including but not limited to Puncturvine, Field Bindweed, Dandelion, Jimsonweed, Diffuse, Spotted and Russian Knapweed, Quackgrass, Horsetail, , Rush Grass, Mustard,

Lambsquarter, Chickweed, Cress, Crabgrass, Canada Thistle, Nutgrass, Blackberry, Tansy Ragwort, Bermuda Grass, Johnsongrass, Poison Ivy, Nut Sedge, Nimble Weed, Bent Grass, , Perennial Sorrel, Cheatgrass, Kochia, Prickly Lettuce, Feral Rye, and Broom Grass or any weed listed on Colorado Noxious Weed List and Watch List.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Materials: The Contractor shall submit to the Engineer for approval a complete list of all materials to be used during this portion of the work prior to delivery of any materials to the site. Include complete data on source, amount and quality. This submittal shall in no way be construed as permitting substitution for specific items described on the plans or in these specifications unless approved in writing by the Engineer.
    1. Sod Certificates:
        a. State, Federal and other inspection certificates for sod shall be provided to the Engineer a minimum of ten (10) working days prior to anticipated date of sod delivery.
        b. Submit a list of varieties contained in the sod and include the source and origin for approval.
    2. Product Certificates: For soil amendments and fertilizers, from manufacturer.

C. Qualification Data: Qualified Landscape Contractor.

D. Analysis and standards: Wherever applicable, for non-packaged materials, provide digital copies of the analysis by a recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists.

E. Planting schedule: Submit in writing the proposed planting schedule, indicating dates for topsoil placing, site preparation, soil preparation, sodding, seeding, and coordination with plant procurement, planting soil preparation, plant delivery and planting. Schedule all work during specified planting seasons. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

F. Contract Closeout Submittals:
    1. Operating and Maintenance Data: At completion of work, submit one (1) digital copy the Engineer in accordance with Division 01 Section “Contract Closeout’. Include directions for irrigation, aeration, mowing, fertilizing and spraying as required for continued and proper maintenance through full growing season and dormant period.
    2. Warranty for Turfgrass Sod Areas: At Substantial Completion, submit a written warranty to the Engineer based upon specified requirements.

1.5 QUALITY CONTROL

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
    1. Experience: Five (5) years' experience in turf installation in addition to requirements in Division 01 Section "Quality Control."

2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site when work is in progress.
3. Sod Producer: Company specializing in sod production and harvesting with minimum five (5) years' experience, and certified by the State of Wyoming/Colorado/Idaho/Montana Department of Agriculture.

B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

C. Pre-installation Conference: Conduct conference at the Project site to coordinate the seeding process with the Engineer. This meeting shall include coordination of equipment movement within planting areas to avoid soil compaction, an overview of proposed methods of installation, review of the performance criteria and maintenance procedures, and an overview of underground utility location maps and plans. This meeting shall be coordinated by the Contractor and comply with requirements in Division 1.

D. Standards: All materials and methods used during this portion of the work shall meet or exceed applicable federal, state, county, and local laws and regulations. All sod shall be free from insects and disease. Species shall be true to their scientific name as specified.

E. Equipment: The Contractor shall furnish all equipment free of noxious weeds, weed seed, plant material, and contaminated soil.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Sod: Harvest, deliver, store, and handle sod so as not to damage or compromise viability. Deliver on pallets properly loaded on vehicles with root system protected from exposure to sun, wind, and heat in accordance with standard practice. Sod that has been damaged by poor handling or improper storage is subject to rejection by the Engineer.
1. Protect from dehydration, contamination, freezing and heating at all times. Keep stored sod moist and under shade or covered with moistened burlap.
2. Do not drop sod rolls from carts, trucks or pallets.
3. Do not deliver more sod than can be installed within twenty four (24) hours.

B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

C. Fertilizer: Deliver inorganic or chemical fertilizer to site in original unopened container bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, warranty and conformance to state law.

D. Material will be inspected upon arrival at project site. Engineer will reject any opened or unacceptable materials as described above.

E. Immediately remove unacceptable material from job site.

1.7 PROJECT/SITE CONDITIONS

A. Work scheduling: Proceed with and complete landscape work as rapidly as portions of the site become available, work within the specified planting season and approved schedule.

B. Vehicular accessibility on site shall be approved by the Engineer.

C. Install sod between April 15 and September 15, or when irrigation is available for twenty one (21) days.

D. Schedule work for periods of favorable weather. Do not install sod on saturated or frozen soil. The Engineer reserves the right to deny sod installation on days that are deemed to be unfavorable for installation.

E. Coordination:
   1. Coordinate with construction of utilities on site. Do not begin placing topsoil and sod until underground work is completed in the area.
   2. Coordinate sodding with the approved schedule. Limit construction access to areas where topsoil has been placed if placement is completed more than 3 days prior to commencement of landscaping in the area. Limit fine grading to areas that can be prepared for planting within twenty four (24) hours after fine grading.
   3. Coordinate with Contractors' work requiring access to site over sodded areas.
   4. Coordinate with installation of underground irrigation system.

1.8 WARRANTY

A. Warranty for Sodded Areas: Warrant sod areas to be in a healthy, vigorous growing condition, and for consistency and completion of coverage for a period of one (1) year from date of Substantial Completion as a full stand of grass. Re-sod any areas where sod has failed due to disease or other inadequate installation, as defined in this Section.
   1. During the original warranty period, immediately replace the sod with an approved sod blend/mix in the areas that have failed to achieve a full stand of grass or which are unhealthy.
   2. Re-sodding will not be allowed in any season considered unfavorable for sod installation as indicated in these Specifications. .

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Preparation: See Section 32 91 .13 – Topsoil Placement & Grading

B. Topsoil: See Section 31 05 13 - Soils for Earthwork

C. Sod Standards:
   1. Colorado grown Kentucky Bluegrass blend having a healthy, vigorous root system. Blend shall contain a minimum of three (3) improved varieties, of which at least one variety is an aggressive type, or approved equal.

2. Sod to be produced in accordance with requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding."
3. Harvesting: Sod shall be fertilized two to three (2–3) weeks prior to harvesting. Mow sod to a height of one and one-half inches (1-1/2") before the sod is lifted. Sod shall be harvested in rolls, and shall not be cut more than 24 hours prior to planting.
4. Size: Machine cut to a minimum pad thickness of three quarters inch (3/4), excluding top growth and thatch. Provide sod of uniform pad sizes eighteen inches (18") maximum width by twenty four (24") minimum length, with maximum five percent (5%) deviation in either length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically from upper ten percent (10%) of pad will be rejected. Sod which has dried out, sod with adhering soil which breaks, tears, or crumbles away will not be accepted. Sod cut for more than twenty-four (24) hours will not be accepted.
5. Plastic netting: Sod to be free of plastic netting used during establishment by sod grower.
6. Inspection will be made periodically during sodding, at completion and at end of Warranty period by the Engineer. Inspection is primarily for quality; however, other requirements are not waived even though visual inspection results in Acceptance.

D. Fertilizer: Inorganic mixture with following chemical composition: (20-5-10) with fifty percent (50%) of the nitrogen source being slow release, or as recommended by testing lab based on soil sample results.

2.2 PESTICIDES

A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use 'Restricted Use' pesticides unless authorized in writing by the Engineer and authorities having jurisdiction.

B. Selective for either of the following types:
1. Broadleaf:
a. 2,4-D Amine,
b. Clopyralid,
c. Aminopyralid,
d. Triclopyr,
e. Or approved equal.
2. Grasses:
a. Imazapic,
b. Indaziflam,
c. Or approved equal.

C. Non-Selective: Broadleaf or Grasses
1. Glyphosate,
2. Or approved equal.

2.3 SUBSTITUTIONS

A. All substitutions shall be submitted to and approved by the Engineer prior to installation.

PART 3 - EXECUTION

3.1 SITE EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.

1. Finish grades shall have consistent slopes as indicated on the Contract Drawings.

2. Verify soil preparation of all areas to be sodded are in accordance with the requirements of Section 32 91 19.13 - Topsoil Placement and Grading.

3. Verify that no foreign or deleterious material or liquid such as, but not limited to, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

B. Locate, protect, and maintain the irrigation system during sodding operations. Verify that the irrigation system is operable, and a coverage test has been completed and approved prior to sodding by the Engineer. Irrigation system components damaged during seeding operations shall be replaced or repaired in accordance with Section 32 80 00 - Landscape Irrigation.

C. Protect grade stakes set by others until removal is directed by the Engineer.

3.2 PREPARATION

A. Work notification: Notify the Engineer at least seven (7) working days prior to start of sodding operations.

B. Limit turf subgrade preparation to areas that can be sodded within twenty four (24) hours.

C. Uniformly moisten excessively dry soil that is not workable.

D. The Contractor shall prepare the soil of all areas to be sodded in accordance with the requirements of Section 32 91 19.13 - Topsoil Placement and Grading.

1. Do not mix or place soils and soil amendments in frozen, dry, or, excessively wet conditions.
2. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

E. Weed Control: Comply with Teton County Weed & Pest weed control requirements stipulated in the Contract Drawings. Do not proceed with planting until the Engineer has approved the specified and completed weed control measures.

F. Fine Grading: Comply with Section 32 91 19.13 - Topsoil Placement and Grading and the Contract Documents.

1. Verify all areas are graded to drain at a minimum of two percent (2%) or as indicated on the Contract Drawings. Maintain positive drainage, prevent ponding and direct run-off into catch basins, drainage structures, etc., and provide well-contoured surface prior to proceeding.
2. Verify that the subsurface drainage system and drain inlets, if present, are operative.
3. A firm weed-free seed bed is required. The seed bed shall be totally free from rock or clay clods or any materials over one inch (1") in diameter. Remove sticks, roots, rubbish, and other extraneous matter and legally dispose of them off-site.
4. Obtain the Engineer's approval of finished grade prior to proceeding with seeding operations.

G. Transition Grading: When areas of new sod abut existing areas, sod shall transition to prevent any abrupt grade breaks.

H. When grading is completed the soil shall be firmed by float dragging, followed by steel raking, to provide for the proper sodded subgrade. The sod bed shall be totally free from rock or clay clods over one-half inch (1/2") inch in diameter.

1. Newly Graded Subgrades: Loosen subgrade to a minimum depth of six inches (6")
2. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:

a. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
b. Loosen surface soil to a depth of at least 8 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top six inches (6") of soil. Till soil to a homogeneous mixture of fine texture.
c. Remove stones larger than one-half (½") inch in any dimension and sticks, roots, trash, and other extraneous matter.
d. Legally dispose of waste material, including grass, vegetation, and turf, off-site.

I. Adjustment: Adjust irrigation heads to proper watering height according to depth of sod material but lower than compacted blade height to enable lawn mowers to cut grass freely without damage to the sprinkler system.

J. Repair: Re-establish grade and specified conditions to damaged sod areas prior to placing sod.

K. Fertilizer: Fertilizer shall be applied topically once final grade has been established and just prior to sodding. Diamonium phosphate, bid quantity to be two (2) pounds of nitrogen per one thousand (1,000) square feet. Apply per manufacturers recommendations for the type of planting area, or per soil test recommendations.

3.3 SOD INSTALLATION

A. Proceed with installation only after unsatisfactory conditions have been corrected and approved by the Engineer.

B. Beginning of installation means acceptance of existing conditions by the Contractor.

C. Sodding:

1. Install sod during approved installation period (April 15 – October 1), unless otherwise approved by the Engineer.
2. Any exposed areas not sodded within the approved installation period will require erosion control protection until sod can be installed.
3. Sod within twenty-four (24) hours after preparation of bed.
4. If plastic netting is present within sod, remove all netting during sod installation and discard from site.
5. Subgrade on which sod is laid shall be slightly moist during installation.
6. Lay sod at full roll width. Remove existing sod prior to installation of new sod in order to permit installation in 18" multiples, typical.
7. Lay sod with longest dimension parallel to contours and in continuous rows.
8. Tightly butt ends and sides of sod together. Stagger and compact vertical joints between sod strips.
9. Sod shall not be overlapped or stretched during placement. Exposed joints due to shrinkage will require replacement of sod in affected areas.

D. Topsoil: Where new sod abuts an existing turf area topsoil shall be placed along seams and or joints to provide a smooth transition.

E. Rolling: After sod and soil have dried, roll sodded areas after installation to ensure proper contact with the subgrade, remove minor depressions and irregularities, and ensure tight joints between adjacent pieces. Sod shall be moist prior to rolling. Once rolling is complete additional watering shall occur. Roller shall not exceed one hundred (100) pounds.

F. Water: Water shall be free of substances that may be harmful to sod growth. Hoses and other watering equipment necessary to water the sod to be furnished by Contractor.

1. Water thoroughly with a fine spray as laying progresses and immediately after planting. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of one and one half inches (1-1/2 ") below sod.

G. Review seasonal restrictions prior to sodding.

3.4 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work Remove all excess materials, debris, and equipment from site.

3.5 PROTECTION AND REPAIR

A. The Contractor shall protect existing utilities, irrigation, paving, and other facilities from damage caused by sodding operations. The Contractor shall repair any damage at their expense. Any areas outside the Contract Limits that are disturbed as a result of construction operations shall be restored at no additional cost to Owner.

B. The Contractor shall repair damage to prepared topsoil and existing surfaces, caused by vehicular access and movement during work under this section, to original condition at no additional cost to Owner.

C. The Contractor shall protect and restrict access from seeded areas until the areas are established and Accepted. Temporary fencing, barricades, and warning signs shall be installed as required, or by direction of the Engineer at no additional cost to Owner. Maintain fencing and barricades throughout the site until the Engineer approves removal.

D. Erosion Control: Review erosion control measures with the Engineer prior to installation. The Contractor shall take measures and furnish equipment and labor necessary to control and prevent soil erosion, blowing soil and accumulation of wind-deposited materials on the site throughout the duration of work. Comply with minimum requirements of erosion control noted in the Contract Drawings.

3.6 ESTABLISHMENT

A. Establishment of the sodded areas are the responsibility of the Contractor until Final Acceptance per the following requirements:

1. General: The establishment period shall begin immediately after each area is sodded and continue for Sixty (60) days or as determined by the Engineer. During this time, the Contractor is responsible for watering, mowing, spraying, weeding, fertilizing and all related work as necessary to ensure that sodded areas are in a vigorous growing condition. Provide all supervision, labor, material and equipment to develop and maintain sodded areas from time of installation.
2. Mowing and Trimming: When turfgrasses reach three and one-half inches (3-1/2") in height, begin weekly mowing program to maintain turf at two and one-half inches (2-1/2") to three inches (3") in height. Do not remove more than 1/3 the height of the grass blade in single mowing. Do not mow when grass is wet. All clippings from adjacent paved areas shall be removed and clippings from mowed turf areas shall be removed to the satisfaction of Engineer.
3. Fertilizing: Within thirty (30) days of sodding and every sixty (60) days thereafter until Acceptance, apply specified fertilizer to maintain optimal turf vigor or per the direction of the Engineer.
4. Weed Control: Control annual weeds by mowing. Do not use pesticides unless approved by the Engineer and Denver Parks Operations Supervisor.
5. Insect and Disease Control: As needed, apply insecticide and fungicide approved by the Engineer and the Parks Operations Supervisor.

3.7 ACCEPTANCE

A. Substantial Completion of sod areas shall be granted when the sod has been applied and stabilized or per the discretion of the Engineer.

B. Final Acceptance will be defined as a healthy uniform turf over the entire sodded area that does not contain any stressed or bare spots greater than one (1) square foot.

1. Sixty (60) days after sodding, prior to Final Acceptance, the sodded areas shall be reviewed by the Engineer and the Contractor. Any areas as determined by the Engineer where the sod has failed to establish shall be re-sodded.
2. The Engineer shall be satisfied with establishment. The sodded areas shall have a full stand of grass, in a vigorous growing condition, thoroughly rooted to the soil with absence of visible joints.

C. Use approved materials to re-establish turf that does not comply with the requirements of these specifications and continue maintenance until turf meets the requirements and reaches Final Acceptance.

D. After Final Acceptance, the sodded areas will become the responsibility of the Owner.

END OF SECTION 32 92 23

SECTION 32 93 00 - PLANTINGS

PART 1 – GENERAL

1.1 SUMMARY

A. The scope of work includes all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for, and incidental to performing all operations in connection with furnishing, delivery, and installation of plant (also known as "landscaping") complete as shown on the drawings and as specified herein.

B. The scope of work in this section includes, but is not limited to, the following:

1. Locate, purchase, deliver and install all specified plants.
2. Water all specified plants.
3. Mulch, fertilize and stake.
4. Maintenance of all specified plants until the beginning of the warranty period.
5. Plant warranty.
6. Clean up and disposal of all excess and surplus material.
7. Maintenance of all specified plants during the warranty period.

1.2 CONTRACT DOCUMENTS

A. Shall consist of specifications and general conditions and the construction drawings. The intent of these documents is to include all labor, materials, and services necessary for the proper execution of the work. The documents are to be considered as one. Whatever is called for by any parts shall be as binding as if called for in all parts.

1.3 RELATED DOCUMENTS AND REFERENCES

A. Related Documents:

1. Drawings and general provisions of contract including general and supplementary conditions and Division I specifications apply to work of this section
2. Related Specification Sections
   a. Section 31 05 13: Soils for Earthwork: Topsoil
   b. Section 32 80 00: Landscape Irrigation
   c. Section 32 91 19.13 - Topsoil Placement and Grading
3. References: The following specifications and standards of the organizations and documents listed in this paragraph form a part of the specification to the extent required by the references thereto. If the requirements of the following referenced standards and specification conflict with this specification section the requirements of this specification shall prevail. If the requirements of any of the following referenced standards and specifications conflict with each other the more stringent requirement shall prevail or as determined by the Owners Representative.
   a. ANSI Z60.1 American Standard for Nursery Stock, most current edition.
   b. ANSI A 300 – Standard Practices for Tree, Shrub and other Woody Plant Maintenance, most current edition and parts.
4. Interpretation of plant names and descriptions shall reference the following documents. Where the names or plant descriptions disagree between the several documents, the most current

document shall prevail.

a. USDA - The Germplasm Resources Information Network (GRIN) http://www.ars-grin.gov/npgs/searchgrin.html
b. Manual of Woody Landscape Plants; Michael Dirr; Stipes Publishing, Champaign, Illinois; Most Current Edition.
c. The New Sunset Western Garden Book, Oxmoor House, most current edition.

5. Glossary of Arboricultural Terms, International Society of Arboriculture, Champaign IL, most current edition.

1.4 VERIFICATION

A. All scaled dimensions on the drawings are approximate. Before proceeding with any work, the Contractor shall carefully check and verify all dimensions and quantities and shall immediately inform the Engineer of any discrepancies between the information on the drawings and the actual conditions, refraining from doing any work in said areas until given approval to do so by the Engineer.

B. In the case of a discrepancy in the plant quantities between the contract drawings and the plant call outs, list or plant schedule, the number of plants or square footage of the planting bed drawn on the contract drawings shall be deemed correct and prevail.

1.5 PROTECTION OF WORK, PROPERTY AND PERSON

A. The Contractor shall adequately protect the work, adjacent property, and the public, and shall be responsible for any damages or injury due to his/her actions.

1.6 CHANGES IN THE WORK

A. The Engineer may order changes in the work, and the contract sum should be adjusted accordingly. All such orders and adjustments plus claims by the Contractor for extra compensation must be made and approved in writing before executing the work involved.

B. All changes in the work, notifications and Contractor's request for information (RFI) shall conform to the contract general condition requirements.

1.7 CORRECTION OF WORK

A. The Contractor, at their own cost, shall re-execute any work that fails to conform to the requirements of the contract and shall remedy defects due to faulty materials or workmanship upon written notice from the Engineer, at the soonest as possible time that can be coordinated with other work and seasonal weather demands.

1.8 DEFINITIONS

All terms in this specification shall be as defined in the "Glossary of Arboricultural Terms" or as modified below.

A. Container plant: Plants that are grown in and/or are currently in a container including boxed trees.

B. Defective plant: Any plant that fails to meet the plant quality requirement of this specification.

C. End of Warranty Final Acceptance: The date when the Engineer accepts that the plants and work in this section meet all the requirements of the warranty. It is intended that the materials and

workmanship warranty for Planting, Planting Soil, and Irrigation work run concurrent with each other.

D. Field grown trees (B&B): Trees growing in field soil for at least 12 months prior to harvest.

E. Healthy: Plants that are growing in a condition that expresses leaf size, crown density, color; and with annual growth rates typical of the species and cultivar's horticultural description, adjusted for the planting site soil, drainage and weather conditions.

F. Kinked root: A root within the root package that bends more than 90 degrees.

G. Maintenance: Actions that preserve the health of plants after installation and as defined in this specification.

H. Maintenance period: The time period, as defined in this specification, which the Contractor is to provide maintenance.

I. Normal: the prevailing protocol of industry standard(s).

J. Engineer: The person appointed by the Owner to represent their interest in the review and approval of the work and to serve as the contracting authority with the Contractor. The Engineer may appoint other persons to review and approve any aspects of the work.

K. Reasonable and reasonably: When used in this specification relative to plant quality, it is intended to mean that the conditions cited will not affect the establishment or long-term stability, health or growth of the plant. This specification recognizes that it is not possible to produce plants free of all defects, but that some accepted industry protocols and standards result in plants unacceptable to this project.

When reasonable or reasonably is used in relation to other issues such as weeds, diseased, insects, it shall mean at levels low enough that no treatment would be required when applying recognized Integrated Plant Management practices.

This specification recognizes that some decisions cannot be totally based on measured findings and that professional judgment is required. In cases of differing opinion, the Engineer's expert shall determine when conditions are judged as reasonable.

L. Root ball: The mass of roots including any soil or substrate that is shipped with the tree within the root ball package.

M. Root ball package. The material that surrounds the root ball during shipping. The root package may include the material in which the plant was grown, or new packaging placed around the root ball for shipping.

N. Root collar (root crown, root flare, trunk flare, flare): The region at the base of the trunk where most of the structural roots join the plant stem, usually at or near ground level.

O. Shrub: Woody plants with mature height approximately less than 15 feet.

P. Spade harvested and transplanted: Field grown trees that are mechanically harvested and immediately transplanted to the final growing site without being removed from the digging machine.

Q. Stem: The trunk of the tree.

R. Acceptance of Landscaping Work: The date at the end of the Planting, Planting Soil, and Irrigation installation where the Engineer accepts that all work in these sections is complete and the Warranty period has begun. This date may be different than the date of substantial completion for the other sections of the project.

S. Stem girdling root: Any root more than ¼ inch diameter currently touching the trunk, or with the

potential to touch the trunk, above the root collar approximately tangent to the trunk circumference or circling the trunk. Roots shall be considered as Stem Girdling that have, or are likely to have in the future, root to trunk bark contact.

T. Structural root: One of the largest roots emerging from the root collar.

U. Tree: Single and multi-stemmed plants with mature height approximately greater than 15 feet.

1.9 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Submit all product submittals 8-weeks prior to installation of plantings.

C. Product data: Submit manufacturer product data and literature describing all products required by this section to the Engineer for approval. Provide submittal eight weeks before the installation of plants.

D. Plant growers' certificates: Submit plant growers' certificates for all plants indicating that each meets the requirements of the specification, including the requirements of tree quality, to the Engineer for approval. Provide submittal eight weeks before the installation of plants.

E. Samples: Owners Representative to select all shrubs if possible.

F. Plant sources: Submit sources of all plants as required by Article – "Selection of Plants" to the Engineer for approval.

G. Close out submittals: Submit to the Engineer for approval.

1. Plant maintenance data and requirements.

H. Warranty period site visit record: If there is no maintenance during the warranty period, after each site visit during the warranty period, by the Contractor, as required by this specification, submit a written record of the visit, including any problems, potential problems, and any recommended corrective action to the Engineer for approval.

1.10 OBSERVATION OF THE WORK

A. The Engineer may observe the work at any time. They may remove samples of materials for conformity to specifications. Rejected materials shall be immediately removed from the site and replaced at the Contractor's expense. The cost of testing materials not meeting specifications shall be paid by the Contractor.

B. The Engineer shall be informed of the progress of the work so the work may be observed at the following key times in the construction process. The Engineer shall be afforded enough time to schedule visit to the site. Failure of the Engineer to make field observations shall not relieve the Contractor from meeting all the requirements of this specification.

1. Site Conditions: review the soil and drainage conditions prior to start of planting.

2. Layout Staking: Review of the plant layout prior to planting.

3. Plant Quality: Review of plant quality at the time of delivery and prior to installation. Review tree quality prior to unloading where possible, but in all cases prior to planting.

4. Completion: Review the completed planting.

1.11 PRE-CONSTRUCTION CONFERENCE

A. Schedule a pre-construction meeting with the Engineer at least seven (7) days before beginning work to review any questions the Contractor may have regarding the work, administrative procedures during construction and project work schedule.

1.12 QUALITY ASSURANCE

A. Substantial Completion of Landscaping Work - Acceptance of the work prior to the start of the warranty period:

1. Once the Contractor completes the installation of all items in this section, the Engineer will observe all work for Substantial Completion acceptance upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of the observation.
2. Substantial Completion acceptance by the Engineer shall be for general conformance to specified size, character and quality and not relieve the Contractor of responsibility for full conformance to the contract documents, including correct species.
3. Any plants that are deemed defective as defined under the provisions below shall not be accepted.

B. The Engineer will provide the Contractor with written acknowledgment of the date of Substantial Completion and the beginning of the warranty period and plant maintenance period which shall extend for two years.

C. Contractor's Quality Assurance Responsibilities: The Contractor is solely responsible for quality control of the work.

D. Installer Qualifications: The installer shall be a firm having at least 5 years of successful experience of a scope like that required for the work, including the handling and planting of large specimen trees in urban areas. The same firm shall install planting soil (where applicable) and plant material.

1. The bidders list for work under this section shall be approved by the Engineer.
2. Installer Field Supervision: When any planting work is in progress, installer shall maintain, on site, a full-time supervisor.
3. Installer's field supervisor shall have a minimum of five years' experience as a field supervisor installing plants and trees of the quality and scale of the proposed project.
4. The installer's crew shall have a minimum of 3 years experienced in the installation of Planting Soil, Plantings, and Irrigation (where applicable) and interpretation of soil plans, planting plans and irrigation plans.
5. Submit references of past projects, employee training certifications that support that the Contractors meets all the above installer qualifications and applicable licensures.

1.13 PLANT WARRANTY

A. Plant Warranty:

1. The Contractor agrees to replace defective work and defective plants. The Engineer shall make the final determination if plants meet these specifications or that plants are defective.

   Plants warranty shall begin on the date of landscape work acceptance and continue for the following periods, classed by plant type:
   a. Shrubs & Trees: 2 (two) years
2. The warranty period will commence when landscaping work, including work described in the

landscaping drawings and Divisions 31 and 32 or the project specifications, is fully complete and accepted by Engineer.

3. All plants shall be warrantied to meet all the requirements for plant quality at installation in this specification. Defective plants shall be defined as plants not meeting these requirements. The Engineer shall make the final determination that plants are defective.
4. Plants determined to be defective shall be removed immediately upon notification by the Engineer and replaced without cost to the Owner, as soon as weather conditions permit and within the specified planting period.
5. Any work required by this specification, or the Engineer during the progress of the work, to correct plant defects including the removal of roots or branches, or planting plants that have been bare rooted during installation to observe for or correct root defects shall not be considered as grounds to void any conditions of the warranty. If the Contractor decides that such remediation work may compromise the future health of the plant, the plant or plants in question shall be rejected and replaced with plants that do not contain defects that require remediation or correction.
6. The Contractor is exempt from replacing plants outside of the warranty period, or that are removed by others, lost or damaged due to occupancy of project, lost or damaged by a third party, vandalism, or any natural disaster.
7. Replacements shall closely match adjacent specimens of the same species. Replacements shall be subject to all requirements stated in this specification. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the Owner.
8. The warranty of all replacement plants shall extend for an additional one-year period from the date of their acceptance after replacement. If a replacement plant is not acceptable during or at the end of the said extended warranty period, the Engineer may elect one more replacement items or credit for each item. These tertiary replacement items are not protected under a warranty period.
9. During, and by the end of the warranty period, remove all tree wrap, ties, and guying unless agreed to by the Engineer to remain in place. All trees that do not have enough caliper to remain upright, or those requiring additional anchorage in windy locations, shall be staked or remain staked, if required by the Owner's Representative.

B. End of Warranty: Final acceptance of plants at the end of the warranty period.

1. At the end of the warranty period, the Engineer shall observe all warranted work, upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date for final observation.
2. End of Warranty Final Acceptance will be given only when all the requirements of the work under this specification and in specification sections Planting Soil and Irrigation have been met.

1.14 SELECTION AND OBSERVATION OF PLANTS

A. The Engineer may review all plants subject to approval of size, health, quality, character, etc. Review or approval of any plant during the process of selection, delivery, installation and establishment period shall not prevent that plant from later rejection if the plant quality changes or previously existing defects become apparent that were not observed.

B. Plant Selection: The Engineer reserves the right to select and observe all plants at the nursery prior to delivery and to reject plants that do not meet specifications as set forth in this specification. If a defect or substandard element can be corrected at the nursery, as determined by the Engineer, the

agreed upon remedy may be applied by the nursery or the Contractor provided that the correction allows the plant to meet the requirements set forth in this specification. Any work to correct plant defects shall be at the Contractor's expense.

1. The Engineer may make invasive observation of the plant's root system in the area of the root collar and the top of the root ball in general in order to determine that the plant meets the quality requirements for depth of the root collar and presence of roots above the root collar. Such observations will not harm the plant.
2. Corrections are to be undertaken at the nursery prior to shipping.

C. The Contractor shall bear all cost related to plant corrections.

D. All plants that are rejected shall be immediately removed from the site and acceptable replacement plants provided at no cost to the Owner.

E. Submit to the Engineer, for approval, plant sources including the names and locations of nurseries proposed as sources of acceptable plants, and a list of the plants they will provide. The plant list shall include the botanical and common name and the size at the time of selection. Observe all nursery materials to determine that the materials meet the requirements of this section.

1. Trees shall be purchased from the growing nursery. Re-wholesale plant suppliers shall not be used as sources unless the Contractor can certify that the required trees are not directly available from a growing nursery. When Re-wholesale suppliers are utilized, the Contractor shall submit the name and location of the growing nursery from where the trees were obtained by the re-wholesale seller. The re-wholesale nursery shall be responsible for any required plant quality certifications.

F. The Contractor shall require the grower or re-wholesale supplier to permit the Engineer to observe the root system of all plants at the nursery or job site prior to planting including random removal of soil or substrate around the base of the plant. Observation may be as frequent and as extensive as needed to verify that the plants meet the requirements of the specifications and conform to requirements.

G. Each tree shall have a numbered seal applied by the Contractor. The seal shall be placed on a lateral branch on the north side of the tree. The seal shall be a tamper proof plastic seal bearing the Contractors name and a unique seven-digit number embossed on the seal.
1. Do not place seals on branches that are so large that there is not enough room for the branch growth over the period of the warranty.

H. The Engineer may choose to attach their seal to each plant, or a representative sample. Viewing and/or sealing of plants by the Engineer at the nursery does not preclude the Engineer's right to reject material while on site. The Contractor is responsible for paying any up charge for the Engineer to attach their seal to specific plants.

I. Where requested by the Engineer, submit photographs of plants or representative samples of plants. Photographs shall be legible and clearly depict the plant specimen. Each submitted image shall contain a height reference, such as a measuring stick. The approval of plants by the Engineer via photograph does not preclude the Engineer's right to reject material while on site.

1.15 PLANT SUBSTITUTIONS FOR PLANTS NOT AVAILABLE

A. Submit all requests for substitutions of plant species, or size to the Engineer, for approval, prior to purchasing the proposed substitution. Request for substitution shall be accompanied with a list of nurseries contacted in the search for the required plant and a record of other attempts to locate the required material. Requests shall also include sources of plants found that may be of a smaller or larger size, or a different shape or habit than specified, or plants of the same genus and species but different cultivar origin, or which may otherwise not meet the requirements of the specifications, but

which may be available for substitution.

1.16 SITE CONDITIONS

A. It is the responsibility of the Contractor to be aware of all surface and sub-surface conditions, and to notify the Engineer, in writing, of any circumstances that would negatively impact the health of plantings. Do not proceed with work until unsatisfactory conditions have been corrected.

1. Should subsurface drainage or soil conditions be encountered which would be detrimental to growth or survival of plant material, the Contractor shall notify the Engineer in writing, stating the conditions and submit a proposal covering cost of corrections. If the Contractor fails to notify the Engineer of such conditions, he/she shall remain responsible for plant material under the warranty clause of the specifications.

B. It is the responsibility of the Contractor to be familiar with the local growing conditions, and if any specified plants will conflict with these conditions. Report any potential conflicts, in writing, to the Engineer.

C. This specification requires that all Planting Soil and Irrigation (if applicable) work be completed and accepted prior to the installation of any plants.

1. Planting operations shall not begin until such time that the irrigation system is completely operational for the area(s) to be planted, and the irrigation system for that area has been preliminarily observed and approved by the Engineer.

D. Actual planting shall be performed during those periods when weather and soil conditions are suitable in accordance with locally accepted horticultural practices.

1. Do not install plants into saturated or frozen soils. Do not install plants during inclement weather, such as rain or snow or during extremely hot, cold or windy conditions.

1.17 PLANTING AROUND UTILITIES

A. Contractor shall carefully examine the civil, record, and survey drawings to become familiar with the existing underground conditions before digging.

B. Determine location of underground utilities and perform work in a manner that will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

C. Notification of *Wyoming One Call* is required for all planting areas: The Contractor is responsible for knowing the location and avoiding utilities that are not covered by the *Wyoming One Call Service*.

PART 2 – PRODUCTS

2.1 PLANTS: GENERAL

A. Standards and measurement: Provide plants of quantity, size, genus, species, and variety or cultivars as shown and scheduled in contract documents.

1. All plants including the root ball dimensions or container size to trunk caliper ratio shall conform

to ANSI Z60.1 “American Standard for Nursery Stock” latest edition, unless modified by provisions in this specification. When there is a conflict between this specification and ANSI Z60.1, this specification section shall be considered correct.

2. Plants larger than specified may be used if acceptable to the Engineer. Use of such plants shall not increase the contract price. If larger plants are accepted the root ball size shall be in accordance with ANSI Z-60.1. Larger plants may not be acceptable if the resulting root ball cannot be fit into the required planting space.

3. If a range of size is given, no plant shall be less than the minimum size and not less than 50 percent of the plants shall be as large as the maximum size specified. The measurements specified are the minimum and maximum size acceptable and are the measurements after pruning, where pruning is required.

B. Proper Identification: All trees shall be true to name as ordered or shown on planting plans and shall be labeled individually or in groups by genus, species, variety and cultivar.

C. Compliance: All trees shall comply with federal and state laws and regulations requiring observation for plant disease, pests, and weeds. Observation certificates required by law shall accompany each shipment of plants.

D. Plant Quality:

1. General: Provide healthy stock, grown in a nursery and reasonably free of die-back, disease, insects, eggs, bores, and larvae. At the time of planting all plants shall have a root system, stem, and branch form that will not restrict normal growth, stability and health for the expected life of the plant
2. Plant quality above the soil line
    a. Plants shall be healthy with the color, shape, size and distribution of trunk, stems, branches, buds and leaves normal to the plant type specified. Tree quality above the soil line shall comply with the project Crown Acceptance and the following:
        1.) Crown: The form and density of the crown shall be typical for a young specimen of the species or cultivar pruned to a central and dominant leader.
            a.) Crown specifications do not apply to plants that have been specifically trained in the nursery as topiary, espalier, multi-stem, clump, or unique selections such as contorted or weeping cultivars.
        2.) Leaves: The size, color, and appearance of leaves shall be typical for the time of year and stage of growth of the species or cultivar. Trees shall not show signs of prolonged moisture stress or over watering as indicated by wilted, shriveled, or dead leaves.
        3.) Branches: Shoot growth (length and diameter) throughout the crown should be appropriate for the age and size of the species or cultivar. Trees shall not have dead, diseased, broken, distorted, or otherwise injured branches.
            a.) Main branches shall be distributed along the central leader not clustered together. They shall form a balanced crown appropriate for the cultivar/species.
            b.) Branch diameter shall be no larger than two-thirds (one-half is preferred) the diameter of the central leader measured 1 inch above the branch union.
            c.) The attachment of the largest branches (scaffold branches) shall be free of included bark.
        4.) Trunk: The tree trunk shall be relatively straight, vertical, and free of wounds that penetrate to the wood (properly made pruning cuts, closed or not, are acceptable and are not considered wounds), sunburned areas, conks (fungal fruiting bodies), wood cracks, sap leakage, signs of boring insects, galls, cankers, girdling ties, or lesions (mechanical injury).

5.) Temporary branches, unless otherwise specified, can be present along the lower trunk below the lowest main (scaffold) branch, particularly for trees less than 1 inch in caliper. These branches should be no greater than 3/8-inch diameter. Clear trunk should be no more than 40% of the total height of the tree.

b. Trees shall have one central leader. If the leader was headed, a new leader (with a live terminal bud) at least one-half the diameter of the pruning cut shall be present.
   1.) All trees are assumed to have one central leader trees unless a different form is specified in the plant list or drawings.
c. All graft unions, where applicable, shall be completely closed without visible sign of graft rejection. All grafts shall be visible above the soil line.
d. Trunk caliper and taper shall be enough so that the lower five feet of the trunk remains vertical without a stake. Auxiliary stake may be used to maintain a straight leader in the upper half of the tree.

3. Plant quality at or below the soil line:
   a. Plant roots shall be normal to the plant type specified. Root observations shall take place without impacting tree health. Root quality at or below the soil line shall comply with the project Root Acceptance details and the following:

      1.) The roots shall be reasonably free of scrapes, broken or split wood.
      2.) The root system shall be reasonably free of injury from biotic (e.g., insects and pathogens) and abiotic (e.g., herbicide toxicity and salt injury) agents. Wounds resulting from root pruning used to produce a high-quality root system are not considered injuries.
      3.) A minimum of three structural roots reasonably distributed around the trunk (not clustered on one side) shall be found in each plant. Root distribution shall be uniform throughout the root ball, and growth shall be appropriate for the species.
          a.) Plants with structural roots on only one side of the trunk (J roots) shall be rejected.
      4.) The root collar shall be within the upper 2 inches of the substrate/soil. Two structural roots shall reach the side of the root ball near the top surface of the root ball. The grower may request a modification to this requirement for species with roots that rapidly descend, provided that the grower removes all stem girdling roots above the structural roots across the top of the root ball.
      5.) The root system shall be reasonably free of stem girdling roots over the root collar or kinked roots from nursery production practices.
          a.) Plant Grower Certification: The final plant grower shall be responsible to have determined that the plants have been root pruned at each step in the plant production process to remove stem girdling roots and kinked roots, or that the previous production system used practices that produce a root system throughout the root ball that meets these specifications. Regardless of the work of previous growers, the plant's root system shall be modified at the final production stage, if needed, to produce the required plant root quality. The final grower shall certify in writing that all plants are reasonably free of stem girdling and kinked roots as defined in this specification, and that the tree has been grown and harvested to produce a plant that meets these specifications.

      6.) At time of observations and delivery, the root ball shall be moist throughout. Roots shall not show signs of excess soil moisture conditions as indicated by stunted, discolored, distorted, or dead roots.

E. Submittals: Submit for approval the required plant quality certifications from the grower where plants are to be purchased, for each plant type. The certification must state that each plant meets all the above plant quality requirements.
   1. The grower's certification of plant quality does not prohibit the Engineer from observing any plant or rejecting the plant if it is found to not meet the specification requirements.

2.2 ROOT BALL PACKAGE OPTIONS

A. The following root ball packages are permitted. Specific root ball packages shall be required where indicated on the plant list or in this specification. Any type of root ball packages that is not specifically defined in this specification shall not be permitted.

B. Balled and Burlapped Plants:

   1. All Balled and Burlapped Plants shall be field grown, and the root ball packaged in a burlap and twine and/or burlap and wire basket package.

   2. Plants shall be harvested with the following modifications to standard nursery practices.

      a. Prior to digging any tree that fails to meet the requirement for maximum soil and roots above the root collar, carefully removed the soil from the top of the root ball of each plant, using hand tools, water or an air spade, to locate the root collar and attain the soil depth over the structural roots' requirements. Remove all stem girdling roots above the root collar. Care must be exercised not to damage the surface of the root collar and the top of the structural roots.

      b. Trees shall be dug for a minimum of 4 weeks and a maximum of 52 weeks prior to shipping. Trees dug 4 to 52 weeks prior to shipping are defined as hardened-off. Digging is defined as cutting all roots and lifting the tree out of the ground and either moving it to a new location in the nursery or placing it back into the same hole. Tress that are stored out of the ground shall be placed in a holding area protected from extremes of wind and sun with the root ball protected by covering with mulch or straw and irrigated sufficiently to keep moisture in the root ball above wilt point and below saturation

      c. If wire baskets are used to support the root ball, a "low profile" basket shall be used. A low-profile basket is defined as having the top of the highest loops on the basket no less than 4 inches and no greater than 8 inches below the shoulder of the root ball package.

         1.) At nurseries where sandy soils prevent the use of "low profile baskets", baskets that support the entire root ball, including the top, are allowable.

      d. Twine and burlap used for wrapping the root ball package shall be natural, biodegradable material. If the burlap decomposes after digging the tree then the root ball shall be re-wrapped prior to shipping if roots have not yet grown to keep root ball intact during shipping.

C. Spade Harvested & Transplanted:
   1. Spade Harvested and Transplanted Plants shall meet all the requirements for field grown trees. Root ball diameters shall be of similar size as the ANSI Z60.1 requirements for Balled and Burlapped plants.
   2. Trees shall be harvested prior to leafing out (bud break) in the spring or during the fall planting period except for plants know to be considered as fall planting hazards. Plants that are fall planting hazards shall only be harvested prior to leafing out in the spring.
   3. Trees shall be moved and planted within 48 hours of the initial harvesting and shall remain in the spade machine until planted.

D. Plant Containers:

1. Container plants may be permitted only when indicated on the drawing, in this specification, or approved by the Engineer.
2. Provide plants shall be established and well rooted in removable containers.
3. Container class size shall conform to ANSI Z60.1 for container plants for each size and type of plant.

2.3 PLANTING SOIL

A. Planting Soil as used in this specification means the soil at the planting site or imported as modified and defined in specification Section Planting Soil. If there is no Planting Soil specification, the term Planting Soil shall mean the soil at the planting site within the planting hole.

2.4 MULCH

A. Mulch shall be "Walk on" grade, coarse, ground, from tree and woody brush sources. The size range shall be a minimum (less than 25% or less of volume) fine particles 3/8 inch or less in size, and a maximum size of individual pieces (largest 20% or less of volume) shall be approximately 1 to 1-1/2 inch in diameter and maximum length approximately 4 to 8". Pieces larger than 8-inch-long that are visible on the surface of the mulch after installation shall be removed.

B. Submit supplier’s product specification data sheet and a one-gallon sample for approval.

PART 3 – EXECUTION

3.1 SITE EXAMINATION

A. Examine the surface grades and soil conditions to confirm final grading has been completed per the drawings and specifications. Notify the Engineer in writing of any unsatisfactory conditions.

3.2 DELIVERY, STORAGE AND HANDLING

A. Protect materials from deterioration during delivery and storage. Adequately protect plants from drying out, exposure of roots to sun, wind or extremes of heat and cold temperatures. If planting is delayed more than 24 hours after delivery, set plants in a location protected from sun and wind. Provide adequate water to the root ball package during the shipping and storage period.

1. All plant materials must be available for observation prior to planting.
2. Using a soil moisture meter, periodically check the soil moisture in the root balls of all plants to assure that the plants are being adequately watered. Volumetric soil moisture shall be maintained above wilting point and below field capacity for the root ball substrate or soil.

B. Do not deliver more plants to the site than there is space with adequate storage conditions. Provide a suitable remote staging area for plants and other supplies.

1. The Engineer shall approve the duration, method and location of storage of plants.

C. Provide protective covering over all plants during transporting.

3.3 PLANTING SEASON

A. Planting shall only be performed when weather and soil conditions are suitable for planting the materials specified in accordance with locally accepted practice. Install plants during the planting time as described below unless otherwise approved in writing by the Engineer. If the Contractor request planting outside the dates of the planting season, approval of the request does not change the requirements of the warranty.

B. Do not plant trees or shrubs until drip irrigation system has been commissioned and is operable.

3.4 ADVERSE WEATHER CONDITIONS

A. No planting shall take place during extremely hot, dry, windy or freezing weather.

3.5 COORDINATION WITH PROJECT WORK

A. The Contractor shall coordinate with all other work that may impact the completion of the work.

B. Prior to the start of work, prepare a detailed schedule of the work for coordination with other trades.

C. Coordinate the relocation of any irrigation lines, heads or the conduits of other utility lines that conflict with tree locations. Root balls shall not be altered to fit around lines. Notify the Engineer of any conflicts encountered.

3.6 LAYOUT AND PLANTING SEQUENCE

A. Extend and install drip irrigation to all trees and shrub locations prior to planting.

B. Relative positions of all plants and trees are subject to approval of the Engineer.

C. Notify the Engineer, one (1) week prior to layout. Layout all individual tree and shrub locations. Place plants above surface at planting location or place a labeled stake at planting location. Layout bed lines with paint for the Engineer’s approval. Secure the Engineer’s acceptance before digging and start of planting work.

D. When applicable, plant trees before other plants are installed.

E. It is understood that plants are not precise objects and that minor adjustments in the layout will be required as the planting plan is constructed. These adjustments may not be apparent until some or all the plants are installed. Adjust as required by the Engineer including relocating previously installed plants.

3.7 SOIL PROTECTION DURING PLANT DELIVERY AND INSTALLATION

A. Protect soil from compaction during the delivery of plants to the planting locations, digging of planting holes and installing plants.

1. Where possible deliver and plant trees that require the use of heavy mechanized equipment prior to final soil preparation and tilling. Where possible, restrict the driving lanes to one area instead of driving over and compacting a large area of soil.

2. Till to a depth of 6 inches, all soil that has been driven over during the installation of plants.

3.8 INSTALLATION OF PLANTS: GENERAL

A. Observe each plant after delivery and prior to installation for damage of other characteristics that may cause rejection of the plant. Notify the Engineer of any condition observed.

B. No more plants shall be distributed about the planting bed area than can be planted and watered on the same day.

C. The root system of each plant, regardless of root ball package type, shall be observed by the Contractor, at the time of planting to confirm that the roots meet the requirements for plant root quality in Part 2 Products: Plants General: Plant Quality. The Contractor shall undertake at the time of planting, all modifications to the root system required by the Engineer to meet these quality standards.

1. Modifications, at the time of planting, to meet the specifications for the depth of the root collar and removal of stem girdling roots and circling roots may make the plant unstable or stress the plant to the point that the Engineer may choose to reject the plant rather than permitting the modification.

2. Any modifications required by the Engineer to make the root system conform to the plant quality standards outlined in Part 2 Products: Plants General: Quality, or other requirements related to the permitted root ball package, shall not be considered as grounds to modify or void the plant warranty.

3. The resulting root ball may need additional staking and water after planting. The Engineer may reject the plant if the root modification process makes the tree unstable or if the tree is not healthy at the end of the warranty period. Such plants shall still be covered under the warranty

4. The Contractor remains responsible to confirm that the grower has made all required root modifications noted during any nursery observations.

D. Container and Boxed Root Ball Shaving: The outer surfaces of ALL plants in containers and boxes, including the top, sides and bottom of the root ball shall be shaved to remove all circling, descending, and matted roots. Shaving shall be performed using saws, knives, sharp shovels or other suitable equipment that can make clean cuts on the roots. Shaving shall remove a minimum of one inch of root mat or up to 2 inches as required to remove all root segments that are not growing reasonably radial to the trunk.

E. Exposed Stem Tissue after Modification: The required root ball modifications may result in stem tissue that has not formed trunk bark being exposed above the soil line. If such condition occurs, wrap the exposed portion of the stem in a protective wrapping with a white filter fabric. Secure the fabric with biodegradable masking tape. DO NOT USE string, twine, green nursery ties or any other material that may girdle the trunk if not removed.

F. Excavation of the Planting Space: Using hand tools or tracked mini-excavator, excavate the planting hole into the Planting Soil to the depth of the root ball measured after any root ball modification to correct root problems, and wide enough for working room around the root ball or to the size indicated on the drawing or as noted below.

1. For trees and shrubs planted in soil areas that are NOT tilled or otherwise modified to a depth of at least 12 inches over more than 10 feet radius from each tree, or 5 feet radius from each shrub, the soil around the root ball shall be loosened as defined below or as indicated on the drawings.
   a. The area of loosening shall be a minimum of 3 times the diameter of the root ball at the surface sloping to 2 times the diameter of the root ball at the depth of the root ball.
   b. Loosening is defined as digging into the soil and turning the soil to reduce the compaction. The soil does not have to be removed from the hole, just dug, lifted and turned. Lifting and turning may be accomplished with a tracked mini excavator, or hand shovels.

2. If an auger is used to dig the initial planting hole, the soil around the auger hole shall be loosened as defined above for trees and shrubs planted in soil areas that are NOT tilled or otherwise modified.

3. The measuring point for root ball depth shall be the average height of the outer edge of the root ball after any required root ball modification.

4. If motorized equipment is used to deliver plants to the planting area over exposed planting beds or used to loosen the soil or dig the planting holes, all soil that has been driven over shall be tilled to a depth of 6 inches.

G. For trees to be planted in prepared Planting Soil that is deeper than the root ball depth, compact the soil under the root ball using a mechanical tamper to assure a firm bedding for the root ball. If there is more than 12 inches of planting soil under the root ball excavate and tamp the planting soil in lifts not to exceed 12 inches.

H. Set top outer edge of the root ball at the average elevation of the proposed finish. Set the plant plumb and upright in the center of the planting hole. The tree graft, if applicable, shall be visible above the grade. Do not place soil on top of the root ball.

I. The Engineer may request that plants orientation be rotated when planted based on the form of the plant.

J. Backfill the space around the root ball with the same planting soil or existing soil that was excavated for the planting space. See Specification Section Planting Soil, for requirements to modify the soil within the planting bed.

K. Brace root ball by tamping Planting Soil around the lower portion of the root ball. Place additional Planting Soil around base and sides of ball in six-inch (6") lifts. Lightly tamp each lift using foot pressure or hand tools to settle backfill, support the tree and eliminate voids. DO NOT over compact the backfill or use mechanical or pneumatic tamping equipment. Over compaction shall be defined as greater than 85% of maximum dry density, standard proctor or greater than 250 psi as measured by a cone penetrometer when the volumetric soil moisture is lower than field capacity.

1. When the planting hole has been backfilled to three quarters of its depth, water shall be poured around the root ball and allowed to soak into the soil to settle the soil. Do not flood the planting space. If the soil is above field capacity, allow the soil to drain to below field capacity before finishing the planting. Air pockets shall be eliminated and backfill continued until the planting soil is brought to grade level.

L. Where indicated on the drawings, build a 4-inch-high, level berm of Planting Soil around the outside of the root ball to retain water. Tamp the berm to reduce leaking and erosion of the saucer.

M. Thoroughly water the Planting Soil and root ball immediately after planting.

N. Remove all nursery plant identification tags and ribbons as per Engineer instructions. The Engineer’s seals are to remain on plants until the end of the warranty period.

O. Remove corrugated cardboard trunk protection after planting.

P. Follow additional requirements for the permitted root ball packages.

3.9 PERMITTED ROOT BALL PACKAGES AND SPECIAL PLANTING REQUIREMENTS

A. The following are permitted root ball packages and special planting requirements that shall be followed during the planting process in addition to the above General planting requirements.

B. BALLED AND BURLAPPED PLANTS

1. After the root ball has been backfilled, remove all twine and burlap from the top of the root ball. Cut the burlap away; do not fold down onto the Planting Soil.

2. If the plant is shipped with a wire basket that does not meet the requirements of a “Low Rise” basket, remove the top 6 - 8 inches of the basket wires just before the final backfilling of the tree.
3. Earth root balls shall be kept intact except for any modifications required by the Engineer to make root package comply with the requirement in Part 2 Products.

C. SPADE HARVESTED AND TRANSPLANTED PLANTS

.

1. After installing the tree, loosen the soil along the seam between the root ball and the surrounding soil out to a radius from the root ball edge equal to the diameter of the root ball to a depth of 8 - 10 inches by hand digging to disturb the soil interface.
2. Fill any gaps below this level with loose soil.

D. CONTAINER (INCLUDES BOXED AND ABOVE-GROUND FABRIC CONTAINERS) PLANTS

1. This specification assumes that most container plants have significant stem girdling and circling roots, and that the root collar is too low in the root ball.
2. Remove the container.
3. Perform root ball shaving as defined in Installation of Plants: General above.
4. Remove all roots and substrate above the root collar and the main structural roots according to root correction details so root system conforms to root observations detail.
5. Remove all substrate at the bottom of the root ball that does not contain roots.
6. Using a hose, power washer or air excavation device, wash out the substrate from around the trunk and top of the remaining root ball and find and remove all stem girdling roots within the root ball above the top of the structural roots.

3.10 STRAIGHTENING PLANTS

A. Maintain all plants in a plumb position throughout the warranty period. Straighten all trees that move out of plumb including those not staked. Plants to be straightened shall be excavated and the root ball moved to a plumb position, and then re-backfilled.

B. Do not straighten plants by pulling the trunk with guys.

3.11 INSTALLATION OF FERTILIZER AND OTHER CHEMICAL ADDITIVES

A. Do not apply any soluble fertilizer to plantings during the first year after transplanting unless soil test determines that fertilizer or other chemical additives is required. Apply chemical additives only upon the approval of the Engineer.

B. Controlled release fertilizers shall be applied according to the manufacturer’s instructions and standard horticultural practices.

3.12 MULCHING OF PLANTS

A. Apply 3 inches of mulch before settlement, covering the entire planting bed area. Install no more than 1 inch of mulch over the top of the root balls of all plants. Taper to 2 inches when abutting pavement.

B. Lift all leaves, low hanging stems and other green portions of small plants out of the mulch if covered.

3.13 WATERING

A. The Contractor shall be fully responsible to ensure that adequate water is provided to all plants during installation. The Contractor shall adjust the automatic irrigation system to provide adequate drip irrigation to each plan.

B. Hand water root balls of all plants to assure that the root balls have moisture above wilt point and below field capacity. Test the moisture content in each root ball and the soil outside the root ball to determine the water content.

3.14 CLEAN-UP

A. During installation, keep the site free of trash, pavements reasonably clean and work area in an orderly condition at the end of each day. Remove trash and debris in containers from the site no less than once a week.
   1. Immediately clean up any spilled or tracked soil, fuel, oil, trash or debris deposited by the Contractor from all surfaces within the project or on public right of ways and neighboring property.

B. Once installation is complete, wash all soil from pavements and other structures. Ensure that mulch is confined to planting beds and that all tags and flagging tape are removed from the site. The Engineer's seals are to remain on the trees and removed at the end of the warranty period.

C. Make all repairs to grades, ruts, and damage by the plant installer to the work or other work at the site.

D. Remove and dispose of all excess planting soil, subsoil, mulch, plants, packaging, and other material brought to the site by the Contractor.

3.15 PROTECTION DURING CONSTRUCTION

A. The Contractor shall protect planting and related work and other site work from damage due to planting operations, operations by other Contractors or trespassers. Maintain protection during installation until Substantial Completion Acceptance. Treat, repair or replace damaged work immediately.

B. Damage done by the Contractor, or any of their sub-contractors to existing or installed plants, or any other parts of the work or existing features to remain, including roots, trunk or branches of large existing trees, soil, paving, utilities, lighting, irrigation, other finished work and surfaces including those on adjacent property, shall be cleaned, repaired or replaced by the Contractor at no expense to the Owner. The Engineer shall determine when such cleaning, replacement or repair is satisfactory.

3.16 PLANT MAINTENANCE PRIOR TO PROJECT SUBSTANTIAL COMPLETION

A. During the project work period and prior to Substantial Completion, the Contractor shall maintain all plants.

B. Maintenance during the period prior to Substantial Completion Acceptance shall consist of pruning, watering, cultivating, weeding, mulching, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, repairing and replacing of damaged tree wrap material, resetting plants to proper grades and upright position, and furnishing and applying such sprays as are necessary to keep plantings reasonably free of damaging insects and disease, and in healthy condition. The threshold for applying insecticides and herbicide shall follow established Integrated Pest Management (IPM) procedures. Mulch areas shall be kept reasonably free of weeds, grass.

3.17 ACCEPTANCE OF LANDSCAPING

A. Upon written notice from the Contractor, the Engineer shall review the work and decide if the work is acceptable.
   1. Notification shall be at least 7 days prior to the date the Contractor is requesting the review.

B. Final acceptance of landscaping work by Engineer shall constitute completion of all irrigation, seeding, sodding and planting.

C. The Plant Warranty period begins at date of written notification of landscape acceptance from the Engineer. The date of landscaping acceptance may be different than the date of project substantial completion.

3.18 MAINTENANCE DURING THE WARRANTY PERIOD BY OTHERS

A. Subsequent to Engineer's acceptance of Landscaping, the Contractor shall make enough site visits to observe the Owner's maintenance and become aware of problems with the maintenance in time to request changes, until the date of End of Warranty Final Acceptance.

   1. Notify the Engineer in writing if maintenance, including watering, is not enough to maintain plants in a healthy condition. Such notification must be made in a timely period so that the Engineer may take corrective action.

      a. Notification must define the maintenance needs and describe any corrective action required.

   2. If the Contractor fails to visit the site and or notify, in writing, the Engineer of maintenance needs, lack of maintenance shall not be used as grounds for voiding or modifying the provisions of the warranty.

B. Provide the following maintenance tasks:
   1. Watering: Provide all water required to keep soil within and around the root balls at optimum moisture content for plant growth.
      a. Maintain all watering systems and equipment and keep them operational.
      b. Monitor soil moisture to provide enough water. Check soil moisture and root ball moisture with a soil moisture meter on a regular basis and record moisture readings. Do not over water.
   2. Restore plants: Reset any plants that have settled or are leaning as soon as the condition is noticed.
   3. Guying and staking: Maintain plant guys in a taught position. Remove tree guys and staking after the first full growing season unless directed by Engineer.
   4. Weed control: Refer to Teton County Weed and Pest criteria provided in the contract documents.
   5. Plant replacement: Replace all plants that are defective as defined in the warranty provisions, as soon as the plant decline is obvious and in suitable weather and season for planting as outlined in above sections. Plants that become defective during the maintenance period shall be covered and replaced under the warranty provisions.
   6. Mulch: Refresh mulch once a year to maintain complete coverage but do not over mulch. At no time shall the overall mulch thickness be greater than 3 inches. Do not apply mulch within 6 inches of the trunks or stems of any plants. Replacement mulch shall meet the requirements of the original approved material. Mulch shall be no more than one inch on top of the root ball surface.
   7. Damage from site use: Repair of damage by site visitors and events, beyond normal wear, are not part of this maintenance. The Engineer may request that the Contractor repair damage beds or plantings for an additional cost. All additional work shall be approved in advance by the Engineer.

3.19 END OF WARRANTY - FINAL ACCEPTANCE

A. At the end of the Warranty and Maintenance period the Engineer shall observe the work and establish that all provisions of the contract are complete, and the work is satisfactory.
   1. If the work is satisfactory, the maintenance period will end on the date of the final observation.
   2. If the work is deemed unsatisfactory, the maintenance period will continue at no additional expense to the Owner until the work has been completed, observed, and approved by the Engineer.

B. Failure to Pass Observation: If the work fails to pass final observation, any subsequent observations must be rescheduled as per above. The cost to the Owner for additional observations will be charged to the Contractor at the prevailing hourly rate of the Owners Representative.

END OF SECTION 32 93 00

SECTION 33 11 13 - PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipe and fittings for potable water main.
   2. Cement treated flowable fill for use at sewer line/culvert crossings
   3. Pipe markers/tracer wire terminal boxes and tracer wire for use with plastic pipe.
   4. Pipe insulation.
   5. Hydrostatic testing of water mains.

B. Related Sections:
   1. Section 03 30 00 - Cast-in-Place Concrete: Concrete for thrust restraints.
   2. Section 31 23 17 - Trenching: Execution requirements for trenching and backfill required by this Section.
   3. Section 33 12 16 - Water Utility Distribution Valves: Valves and valve boxes for water main installation.
   4. Section 33 13 00 - Disinfecting of Water Utilities: Disinfection of water piping.
   5. Section 33 14 00 - Water Utility Distribution Equipment

1.3 REFERENCE STANDARDS

A. American Water Works Association:
   1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
   2. AWWA C110 - Ductile-Iron and Gray-Iron Fittings.
   3. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   4. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
   5. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast.
   6. AWWA C153 - Ductile-Iron Compact Fittings.
   7. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.
   8. AWWA C906 - Polyethylene Pipe and Fittings, 4 In. Through 63 In. for Water Distribution.
   9. Handbook of Polyethylene Pipe, Second Edition, PPI.
   10. ASTM F 2164 – Field Leak Testing of Polyethylene Pressure Piping Systems using Hydrostatic Pressure.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on all materials specified herein.

C. Submit pipe and fittings manufacturer's recommended for installation procedures.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 – Closeout Procedures: Requirements for closeout procedures.

B. Project Record Documents:
   1. Comply with requirements specified in Section 01 77 00 – Closeout Procedures.
      a. Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
   2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

C. Pressure Testing Results: Record and submit field testing procedures and results including methods, test durations, pressures, test sections and any leakage for each waterline tested.

D. Tracer Wire Continuity Testing: Record and submit field testing results.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Block individual and stockpiled pipe lengths to prevent moving.

C. Do not place pipe or pipe materials on private property, outside the construction limits, or in areas obstructing pedestrian or vehicle traffic.

D. Store polyethylene and PVC materials out of sunlight.

1.7 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

1.8 RECORD DRAWINGS

A. Comply with Section 01 77 00 – Closeout Procedures.

B. A separate set of utility drawings shall be maintained at the job site at all times and shall be used as record drawings. This set shall be kept up to date with all changes and/or additions in the construction of buried water main, services lines, valves and existing utilities discovered during installation. This set of drawings shall be kept clean and protected at all times and shall be submitted to the Engineer for approval following final completion.

PART 2 PRODUCTS

2.1 DUCTILE IRON WATER PIPING

A. All water main piping and fittings called for in the plans shall be ductile iron.

B. Ductile-Iron Pipe with push-on or mechanical joints: AWWA C151 Pressure Class 350. Bituminous Outside Coating: AWWA C151. Pipe Mortar Lining: AWWA C104, double thickness.

C. Fittings: Ductile iron flanged, AWWA C110. Ductile iron mechanical joint, AWWA C153 unless called out as AWWA C110 on the drawings.
   1. Coating and Lining:
      a. Bituminous Coating: AWWA C110 or C153.
      b. Cement Mortar Lining: AWWA C104, double thickness.

D. Joints:
   1. Mechanical and Push-on Joints: AWWA C111.
   2. Flanged Joints: AWWA C115.
   3. Joint Hardware: Grade 304 Stainless Steel with minimum yield strength of 45 ksi.

E. All pipe indicated on the drawings as requiring Fusion Bonded Epoxy Coating (FBE) shall be coated inside and out with a 15 mil fusion bonded epoxy coating in conformance with AWWA C116 utilizing Scotchkote 206N Fusion Bonded Epoxy Coating, or approved equal. Coating shall be NSF ANSI 61 approved. Field repair and touchup of fusion bonded epoxy coatings shall be performed utilizing Scotchkote 323/323i Liquid Epoxy, or approved equal.

2.3 MISCELLANEOUS FITTINGS AND ACCESSORIES

A. Coupling:
   1. Manufacturer/Model: Romac Alpha, or approved equal.
   2. Material: Ductile Iron
   3. Minimum Pressure Rating: 250 psi
   4. Paint: Fusion bonded epoxy, or equivalent.
   5. Hardware: Grade 304 stainless steel.
   6. Size: Determine the actual O.D. of the existing lines prior to ordering.

B. End Cap:
   1. Manufacturer/Model: Romac Alpha EC, or approved equal.
   2. Material: Ductile Iron
   3. Minimum Pressure Rating: 250 psi
   4. Paint: Fusion bonded epoxy, or equivalent.
   5. Hardware: Grade 304 stainless steel.
   6. Size: Determine the actual O.D. of the existing lines prior to ordering.

C. Transition Coupling:
   1. Manufacturer/Model: Smith-Blair 462 “Quantum”, or approved equal.
   2. Material: Ductile Iron
   3. Minimum Pressure Rating: 250 psi

4. Paint: Fusion bonded epoxy, or equivalent.
5. Hardware: Grade 304 stainless steel.
6. Size: Determine the actual O.D. of the existing lines prior to ordering.

D. Restraint Flange Coupling Adapter:
1. Manufacturer/Model: Smith-Blair 911, Romac RFCA, or approved equal.
2. Minimum Pressure Rating: 250 psi.
3. Flange: ANSI Class 150 lb.
4. Paint: Fusion bonded epoxy, or equivalent.
5. All hardware shall be Grade 304 stainless steel.

E. Mechanical Thrust Restraint:
1. Manufacturer/Type: Romac Grip Rings, RomaGrip or EBAA Iron Megalug Series 1100 for uncoated Ductile Iron Pipe, or approved equal. FBE coated Ductile Iron Pipe shall utilize Romac RomaGrip Pipe Restraint supplied with FBE coating.
2. Material: Ductile Iron (ASTM A536)
3. Working Pressure: 250 psi
4. Design Standard: ANSI/AWWA C110/A21.10
5. Coating: Epoxy, Powder, or equivalent.
6. All hardware shall be Grade 304 stainless steel.

2.4 WATER LINE SEPARATION AT SEWER LINE/CULVERT CROSSINGS

A. Utilize cement treated flowable fill as specified under Section 31 23 24 – Flowable Fill.

2.5 PIPE LOCATING AND MARKING

A. Utility Line Marking Tape (Plastic and DIP):
1. Manufacture: Lineguard, Inc., Wheaton, Illinois, Reef Industries, Inc., Houston, Texas or approved equal.
2. Construction: Metallic foil laminated between two layers of impervious plastic film not less than 2 inches wide. Total thickness of tape shall not be less than 0.005 inch (5 mil) plus or minus 10 percent manufacturing tolerances:
3. Inert plastic. Each film layer shall be not less than 0.0005 inch thick (0.5 mil).
4. Foil: Not less than 0.0005 inch thick (0.05 mil).
5. Adhesive: Compatible with foil and film.
6. Imprint: 3/4-inch or larger bold black letters.
7. Legend: Identify buried utility line tape with the actual utility type and imprint such as "Caution: Waterline Below". Repeat identification at approximately 24-inch intervals.
8. Background Color: American Public Works Association (APWA) color code.

2.6 PIPE INSULATION (Plastic and DIP):

A. Type: 2” thick 24” wide polyiso blueboard rigid insulation.
1. The five year aged ‘R’ Value per inch shall be five when tested at 75 EF mean temperature in accordance with ASTM Specification C-518.
2. Minimum compressive strength of 40 psi when tested in accordance with ASTM D-1621.
3. Maximum water absorption of 0.1% by volume when tested in accordance with ASTM C-272.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 73 40 - Execution: Requirements for installation examination.

B. Verify that existing utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

A. Section 01 73 40 - Execution: Requirements for installation preparation.

B. Preconstruction Site Video:
   1. Accompanied by Engineer, videotape entire pipe corridor length with narration on the recording as to approximate stationing.
   2. Record all existing visual features across entire width of allowed disturbance area.
   3. Provide Engineer one copy of complete video recording prior to start of Work.
   4. Comply with Section 01 32 33 – Photographic and Video Documentation.

C. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Use only equipment specifically designed for pipe cutting. The use of chisels or hand saws is not permitted. Grind edges smooth with beveled end for push-on connections.

D. Remove scale and dirt on inside and outside before assembly.

E. Prepare pipe connections to equipment with flanges or unions.

3.3 EXCAVATION

A. Excavate pipe trench as specified in Section 31 23 17 - Trenching.

B. Dewater excavations to maintain dry conditions and preserve final grades at bottom of excavation as specified in Section 31 23 19 – Dewatering.

C. Provide sheeting and shoring as specified in Section 31 23 17 - Trenching.

3.4 INSTALLATION

A. Pipe:
   1. Install ductile iron pipe according to AWWA C600.
   3. Handle and assemble pipe according to manufacturer's instructions and as indicated on Drawings.
   4. Install pipe to indicated elevation to within vertical tolerance of one inch (1”).
   5. Install pipe with no high points. If unforeseen field conditions arise that necessitate high points, install air release valves as directed by Engineer.
   6. Install pipe to have bearing along entire length of pipe. Excavate bell holes to permit proper joint installation. Do not lay pipe in water or frozen trench.
   7. Prevent foreign material from entering pipe during placement.
   8. Install pipe to allow for expansion and contraction without stressing pipe or joints.

9. Close pipe openings with watertight plugs during work stoppages.
10. Install access fittings to permit pressure testing as required herein and disinfection of water system performed under Section 33 13 00 - Disinfecting of Water Utilities.
11. Establish elevations of buried piping with not less than six feet of cover. Measure depth of cover from final surface grade to top of pipe barrel.

B. Separation of Water Mains and Sewers

1. Comply with Wyoming Department of Environmental Quality Rules and Regulations.
2. PARALLEL INSTALLATION
   a. NORMAL CONDITIONS - Water mains shall be laid at least TEN (10) feet horizontally from any sanitary sewer, storm sewer, or manhole, whenever possible. The distance shall be measured edge-to-edge.
   b. UNUSUAL CONDITIONS - When local conditions prevent a horizontal separation of TEN (10) feet, a water main may be laid closer to a sanitary sewer, STORM SEWER, OR MANHOLE, provided that:
      1) The bottom of the water MAIN is at least EIGHTEEN (18) inches above the top of the SANITARY OR STORM sewer, OR
      2) The trench backfill consists of cement-treated backfill (flowable fill) in accordance with Section 31 23 24. Cement-treated backfill must bear on undisturbed soil.
      3) Where EIGHTEEN (18) INCHES vertical separation AS NOTED ABOVE cannot be obtained, the sewer shall be:
         a) Constructed of materials and with joints that are equivalent to water main standards of construction and tested for water tightness by sewerline methods; or
         b) The waterline or sewerline shall be placed in a separate casing pipe.
3. CROSSING
   a. NORMAL CONDITIONS - Water mains crossing sanitary sewers, sanitary sewer service lines, or storm sewers shall be laid above to provide a vertical separation of at least eighteen (18) inches whenever possible. The distance shall be measured from the top of the sewer pipe to the bottom of the water pipe.
   b. UNUSUAL CONDITIONS - When local conditions prevent a vertical separation of at least EIGHTEEN (18) inches AS NOTED ABOVE, the following construction shall be used:
      1) The sanitary sewer or storm sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be tested for water tightness by sewer line methods; or
      2) The sanitary sewer, storm sewer or water main shall be placed in a separate casing pipe.
      3) The water main and intersecting utility shall be encased in cement treated flowable fill as shown on the plan details.

4) The length of the sewer line constructed to water main standards or the casing pipe or encasement shall extend a minimum of nine (9) feet each side of the crossing.

5) Water mains passing under sewer lines shall in addition to the above requirements, be protected by providing adequate structural support for the sewer line. Soil structural support shall consist of cement-treated flowable fill in accordance with drawing details. Cement-treated flowable fill must bear on undisturbed soil.

D. Utility Line Marking Tape: Install in accordance with trench section details in the Drawings.

E. Valves
   1. Install valves as specified in Section 33 12 16 - Water Utility Distribution Valves, and according to manufacturer's recommendations.

3.5 THRUST RESTRAINTS

A. Provide unrestrained valves, tees, bends, caps, and plugs with mechanical thrust restraint, or concrete thrust blocks as required per plan.
   1. Mechanical Thrust Restraint: Install according to manufacturer's recommendations. Install tie rods, clamps, setscrew retainer glands, or restrained joints. Protect metal-restrained joint components against corrosion by applying a bituminous coating or by concrete mortar encasement of metal area. Do not encase pipe and fitting joints to flanges.
   2. Concrete Thrust Blocks: Pour concrete thrust blocks against undisturbed earth. Locate thrust blocks at each elbow or change of pipe direction to resist resultant force and so pipe and fitting joints will be accessible for repair. Provide plastic bond break between concrete and fitting. Required dimensions of thrust blocks are shown on the drawing details.

3.6 CONNECTIONS TO EXISTING SYSTEM

A. All connections to water mains in use shall be made by the Contractor. Contractor requirements include:
   1. Complete hydrostatic testing, flushing, disinfection and final acceptance of new transmission and distribution mains prior to completing connection Work.
   2. Furnish and install all materials as shown in the plans and described in these specifications.
   3. Provide pothole excavation to expose existing pipe at proposed connection locations in order to determine existing pipe O.D. prior to ordering of connection couplings.
   4. Make all necessary excavations to assure gradual transition between the new and existing water main.
   5. Drain and dispose of residual water remaining in the existing main after isolation.
   6. Cut-out and properly dispose of and/or abandon portions of existing system components as required,
   7. Perform all necessary backfilling according to Section 31 23 17 – Trenching.

B. Where the connection of new work to old requires interruption of service and notification of customers affected, Water and Sewer District Operators, the Engineer and the Contractor shall mutually agree in advance upon a date and time for connections which will allow ample time to

assemble labor and materials, and to allow the Engineer adequate time to notify all customers affected.

1. Contractor shall provide Engineer one week advance notice of outages.
2. Do not conduct planned utility interruptions outside the days of Monday through Wednesday.
3. Planned service outages for all customer connections shall not exceed four (4) hours in length unless special acceptable arrangements are made in the field, and in some cases shall be completed in less.
4. Anticipated length of all service disruptions shall be approved by the Engineer prior to the beginning of work.

C. Execution of Service Interruptions: ToJ staff will physically isolate the existing line section to be connected into by closing adjacent valves. Note: Existing valves may not close bubble tight and some leakage water may be experienced. **The Contractor is not authorized, except under emergency conditions, to operate water main valves without consent from ToJ operators.**

3.7 BACKFILLING

A. Backfill around sides and above pipe as specified in Section 31 23 17 - Trenching.

B. Maintain optimum moisture content of bedding material to attain required compaction density.

3.8 DISINFECTION OF POTABLE WATER PIPING SYSTEM

A. Flush and disinfect system as specified in Section 33 13 00 - Disinfecting of Water Utilities.

3.9 PRESSURE (HYDROSTATIC) TESTING

A. Conduct Work in the presents of the Engineer, or representative thereof.

B. Submit pressure testing results in accordance with the Closeout Submittals article above.

C. Provide all additional system equipment and apparatus not otherwise called out on the drawings, but necessary to effectuate the testing protocols as described below.

D. Utilize access points located at valves and near structures and vaults to complete pressure testing.

E. Coordinate use of potable water for pressure testing with Engineer and ToJ Staff.
   1. Comply with Section 01 50 00 – Temporary Facilities and Controls/Article 3.5 “Potable Water Usage.”

F. Pressure test ductile iron piping systems hydrostatically according to AWWA C600 and the following:
   1. Test Pressure: 200 psig at low point in test length.
   2. Conduct hydrostatic test for at least two hours.
   3. Slowly fill section to be tested with water; expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.

4. Observe joints, fittings, and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
5. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine leakage rate. Maintain pressure within plus or minus 5 psi of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.
6. Compute maximum allowable leakage by the following formula:

L = SD x sqrt(P)/C
L = testing allowance, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during hydrostatic test, in psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

7. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

G. Perform hydrostatic pressure test on HDPE piping installed within the trench according to ASTM F 2164.
1. Test Pressure: 1.5 times the operating pressure at the lowest point.
2. Maximum test section length shall be limited to 2000 lineal feet.
3. Test fluid and test pipe section shall not exceed 80º F.
4. Leak test time shall be less than 8 hours.
5. The test section shall be completely filled with the test liquid, taking care to bleed off any trapped air. Venting at high points may be required to purge air pockets while the test section is filling.
6. For plastic pipe, the test procedure consists of initial expansion, and test phases. For the initial expansion phase, the test section is pressurized to test pressure and makeup test liquid is added as required to maintain maximum test pressure for four hours. For the test phase, the test pressure is reduced by 10 psi. This is the target test pressure. If the pressure remains steady (within 5% of the target test pressure) for one hour, leakage is not indicated.
7. If the pressure leak test is not completed due to leakage, equipment failure, etc., the test section shall be de-pressurized and repairs made. Allow the test section to remain de-pressurized for at least 8 hours before retesting.

H. Remove or disable as per the requirements of the Engineer, all temporary system equipment and apparatus installed to effectuate the testing protocols.

END OF SECTION 33 11 13

SECTION 33 12 13 - WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipe and fittings for domestic water service connections, extensions, realignments and repairs.
   2. Corporation stop assembly.
   3. Curb stop assembly.
   4. Bedding and cover materials.
   5. Underground pipe markers.
   6. Flushing Hydrant Assembly

B. Related Sections:
   1. Section 31 05 13 - Soils for Earthwork.
   2. Section 31 05 16 - Aggregates for Earthwork.
   3. Section 31 10 00 – Site Clearing.
   4. Section 31 23 16 - Excavation.
   5. Section 31 23 17 - Trenching.
   6. Section 31 23 19 – Dewatering: Removal of groundwater to permit installation of waterlines.
   7. Section 31 23 23 - Fill.
   8. Section 33 13 00 - Disinfecting of Water Utility Distribution

1.3 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
   1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
   2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

B. American Society of Sanitary Engineering:
   1. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent.
   2. ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

C. ASTM International:
   1. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
   2. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
   3. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
   4. ASTM C858 - Standard Specification for Underground Precast Concrete Utility Structures.
   5. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

6. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
7. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
8. ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
9. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
10. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
11. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
12. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

D. American Welding Society:
   1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

E. American Water Works Association:
   1. AWWA C700 - Cold-Water Meters - Displacement Type, Bronze Main Case.
   2. AWWA C706 - Direct-Reading, Remote-Registration Systems for Cold-Water Meters.
   3. AWWA C800 - Underground Service Line Valves and Fittings.
   4. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service.
   5. AWWA M6 - Water Meters - Selection, Installation, Testing, and Maintenance.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on pipe materials, pipe fittings, corporation stop assemblies, curb stop assemblies, meters, meter setting equipment, service saddles, backflow preventer, and accessories.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents: Record actual locations of piping mains, curb stops, connections, thrust restraints, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with State and plumbing code standards.

B. All products shall meet NSF low-lead requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. During loading, transporting, and unloading of materials and products, exercise care to prevent any damage.

C. Store products and materials off ground and under protective coverings and custody, away from walls and in manner to keep these clean and in good condition until used.

D. Exercise care in handling precast concrete products to avoid chipping, cracking, and breakage.

PART 2 PRODUCTS

2.1 WATER SERVICE PIPING AND FITTINGS

A. Polyethylene Pipe: AWWA C901, DR 11 for 160 psi pressure rating:
   1. Fittings: AWWA C901, molded or fabricated.
   2. Joints: Compression or Butt fusion.
   3. Connection to Building Piping: HDPT but fusion x brass FIPT/MIPT transition.

2.2 SADDLE & CORPORATION STOP ASSEMBLY

A. Manufacturers:
   1. Mueller Co, A.Y. McDonald Mfg. Co., or approved equal.

B. Corporation Stops:
   1. Brass or red brass alloy body conforming to ASTM B62.
   2. Inlet: Inlet end threaded for tapping according to AWWA C800.
   3. Outlet: Threaded or compression connection compatible with PE service pipe size.

C. Service Saddles:
   1. Manufacturers:
      a. Mueller Co, A.Y. McDonald Mfg. Co., or approved equal.
   2. Threaded for tapping according to AWWA C800.
   3. Double strap type, designed to hold pressures in excess of 160 psi.
   4. Hardware: 304 S.S. Hardware.

2.3 CURB STOP ASSEMBLY

A. Manufacturers:
   1. Mueller Co, A.Y. McDonald Mfg. Co., or approved equal.

B. Curb Stops:
   1. Brass or red brass alloy body conforming to ASTM B62.

2. Plug type valve.
3. Positive pressure sealing.
4. Inlet/Outlet: Threaded or compression connection compatible with service pipe type and size.

C. Curb Boxes and Covers:
1. Cast iron body, Extension Type or Buffalo Type.
2. Minneapolis or Arch Pattern Base.
3. Lid with inscription WATER, with Pentagon Plug.

2.4 UNDERGROUND PIPE MARKERS

A. Comply with Section 31 23 17 – Trenching.

2.5 FLUSHING HYDRANT ASSEMBLIES

A. Blow-Off Hydrants:
1. Manufacturer/Model: Kupferle Eclipse #2, or approved equal.
2. Description:
a. Hydrants shall be non-freezing, self-draining type.
b. Working parts shall be of bronze-to-bronze design and be serviceable from above grade with no digging.
c. Hydrants shall be lockable to prevent unauthorized entry.
3. Inlet: 3” MJ
4. Outlet: 2½ inch NST (bronze).
5. Depth of Bury: 7-ft.
6. Overall Length: 10 feet.
7. Hydrant Accessories:
a. Locking Wrench Option

2.8 BEDDING AND COVER MATERIALS

A. Trenching, Bedding and Backfill: Comply with Section 31 23 17 – Trenching.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.

B. Verify building service connection and municipal utility water main size, location, and invert are as indicated on Drawings by potholing.

3.2 PREPARATION

A. Section 01 73 40 - Execution: Requirements for installation preparation.

B. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare pipe connections to equipment with flanges or unions.

E. Dewater excavations prior to manhole or structure installation. Comply with Section 31 23 19 – Dewatering, and associated permitting requirements for temporary discharges involving construction activities.

3.3 INSTALLATION - CORPORATION STOP ASSEMBLY

A. Complete connections to existing water mains by using a tapping valve so as not to interrupt service.

B. Make connection for each different kind of water main using suitable materials, equipment and methods approved by the Owner and product manufacturer.

C. Provide service clamps for mains other than of cast iron or ductile iron mains.

D. Screw corporation stops directly into tapped and threaded iron main at 10 and 2 o'clock position on main's circumference; locate corporation stops at least 12 inches apart longitudinally and staggered.

E. For plastic pipe water mains, provide full support for service clamp for full circumference of pipe, with minimum 2 inches width of bearing area; exercise care against crushing or causing other damage to water mains at time of tapping or installing service clamp or corporation stop.

F. Use proper seals or other devices so no leaks are left in water mains at points of tapping; do not backfill and cover service connection until approved by the Engineer.

3.4 BEDDING

A. Excavate pipe trench in accordance with Section 31 23 17 – Trenching, for Work of this Section.

B. Place bedding material at trench bottom, level fill materials in one continuous layer of 6 inches compacted depth; compact to 95 percent.

C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent.

D. Place fill material in accordance with Section 31 23 17 – Trenching.

3.5 INSTALLATION - PIPE AND FITTINGS

A. Maintain separation of water main from sewer piping in accordance with the Wyoming Department of Environmental Quality Rules and Regulations, details in the drawings and Section 31 23 17 – Trenching.

B. Install pipe to indicated elevation to within tolerance of 1 inch.

C. Install underground warning tape continuous over top of pipe and buried 18 inches below grade. Comply with Section 31 23 17 – Trenching.

D. Tracer Wire:
   1. Install tracer wire continuous over the top of all HDPE pipe.
   2. Tape to pipe at twenty foot intervals.
   3. Provide with adequate slack to prevent breakage during the backfill process.
   4. Splices are to be avoided wherever possible. Required splices shall be completed by use of a butt style connector, heat shrink sleeve, and a slack loop.
   5. Terminate tracer wire inside the building and at tapping saddle at main.
   6. The continuity of all tracer wire segments will be verified by the Contractor and Engineer prior to final acceptance. Submit test results in accordance with the Closeout Submittals article above.

E. Backfill trench in accordance with Section 31 23 17 – Trenching.

3.6 INSTALLATION - CURB STOP ASSEMBLY

A. Set curb stops on minimum 4 x 8 x 16 inch concrete block. Soil below block shall be undisturbed and/or compacted to 95% maximum density.

B. Center and plumb curb box over curb stops. Set box cover flush with finished grade.

3.9 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system in accordance with Section 33 13 00**.**

3.10 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting, testing.

B. Pressure (Hydrostatic) Testing:
   1. Conduct Work in the presents of the Engineer, or representative thereof.
   2. Submit pressure testing results in accordance with the Closeout Submittals article above.
   3. Provide all additional system equipment and apparatus not otherwise called out on the Drawings, but necessary to effectuate the testing protocols as described below.
   4. Pressure test system in accordance with AWWA C600 and the following:
      a. Test Pressure: Not less than 200 psi or 50 psi in excess of maximum static pressure, whichever is greater.
      b. Conduct hydrostatic test for at least two hours.
      c. Fill section to be tested with water slowly, expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
      d. Observe joints, fittings and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
      e. Correct visible deficiencies and continue testing at same test pressure for additional 2 hours to determine leakage rate. Maintain pressure within plus or minus 5.0 psig of test pressure. Leakage is defined as quantity of water supplied to piping necessary to maintain test pressure during period of test.

f. Compute maximum allowable leakage by the following formula:

$L = (SD\sqrt{P})/C$
L = testing allowance, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of pipe, in inches
P = average test pressure during hydrostatic test, in psig
C = 148,000
When pipe under test contains sections of various diameters, calculate allowable leakage from sum of computed leakage for each size.

5. When test of pipe indicates leakage greater than allowed, locate source of leakage, make corrections, and retest until leakage is within allowable limits. Correct visible leaks regardless of quantity of leakage.

C. Hydrostatic Pressure Test on HDPE Piping:
   a. Test Pressure: 1.5 times the operating pressure.
   b. Maximum test section length shall be limited to 2000 lineal feet.
   c. Test fluid and test pipe section shall not exceed 80º F.
   d. Leak test time shall be less than 8 hours.
   e. The test section shall be completely filled with the test liquid, taking care to bleed off any trapped air. Venting at high points may be required to purge air pockets while the test section is filling.
   f. The test procedure consists of initial expansion, and test phases. For the initial expansion phase, the test section is pressurized to test pressure and makeup test liquid is added as required to maintain maximum test pressure for four hours.
   g. For the test phase, the test pressure is reduced by 10 psi. This is the target test pressure. If the pressure remains steady (within 5% of the target test pressure) for one hour, leakage is not indicated.
   h. If the pressure leak test is not completed due to leakage, equipment failure, etc., the test section shall be de-pressurized and repairs made. Allow the test section to remain de-pressurized for at least 8 hours before retesting.

D. Remove or disable as per the requirements of the Engineer, all temporary system equipment and apparatus installed to effectuate the testing protocols.

E. Compaction Testing of Backfill: In accordance with Section 31 23 17 – Trenching.

END OF SECTION 33 12 13

SECTION 33 12 16 - WATER UTILITY DISTRIBUTION VALVES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Underground Valves.
   2. Underground Valve boxes.

B. Related Sections:
   1. Section 03 30 00 - Cast-In-Place Concrete.
   2. Section 31 05 16 - Aggregates for Earthwork.
   3. Section 31 23 17 – Trenching.
   4. Section 33 11 13 – Public Water Utility Distribution Piping.
   5. Section 33 13 00 - Disinfecting of Water Utility Distribution.

1.3 REFERENCES

A. American Water Works Association:
   1. AWWA C509 - Resilient-Seated Gate Valves for Water-Supply Service.
   2. AWWA C515 – Reduced Wall, Resilient Seated Gate Valves for Water Supply Service
   3. AWWA C550 - Protecting Epoxy Interior Coating for Valves and Hydrants.

B. National Sanitation Foundation:
   1. NSF 61 - Drinking Water System Components - Health Effects.
   2. NSF 61, Annex F – Allowable limit for lead extracted from test bodies.
   3. NSF/ANSI 372 – Drinking Water System Components, including lead free requirements.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on all materials specified herein.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 – Closeout Procedures: Requirements for submittals.

B. Project Record Documents: Record actual locations of valves.

C. Provide Operation and Maintenance Data for valves.

1.6 DELIVERY, STORAGE AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for transporting, handling, storing and protecting products.

B. Prepare valves and accessories for shipment according to AWWA Standards and seal valve and ends to prevent entry of foreign matter into product body.

C. Store products in areas protected from weather, moisture, or possible damage; do not store products directly on ground; handle products to prevent damage to interior or exterior surfaces.

1.7 MAINTENANCE MATERIALS

A. Section 01 78 23 – Operation and Maintenance Data: Requirements for maintenance materials.

B. Furnish one tee wrench to Owner; required length to be specified.

PART 2 PRODUCTS

2.1 RESILIENT WEDGE-STYLE GATE VALVES

A. Resilient Wedge Gate Valves: AWWA C515; ductile iron body, including the manufacturer's name, pressure rating, and year of fabrication cast into valve body.
   1. Resilient seats.
   2. Stem: Non-rising bronze stem.
   3. Operator: 2” square nut; open counterclockwise.
   4. Provide stem extension as shown on the plan details.
   5. Ends: Flanged or mechanical joint as shown on the drawings.
   6. Coating: AWWA C550; interior/exterior, NSF 61 approved.
   7. Sizes 12 inch diameter and smaller: 250 psig allowable water working pressure.
   8. Bonnet bolts shall be stainless steel with bronze nuts.
   9. End connection hardware shall be Grade 304 stainless steel.
   10. Non-restrained valves requiring thrust blocks: Stainless steel all thread j-bolts utilized as buried valve thrust block anchorage shall be minimum ½” ø, manufactured from stainless steel rod having a minimum yield strength of 50,000 psi. Concrete shall be minimum Class 3000. Stainless steel chain used as vertical holddowns for valves shall be ½” stainless steel with a minimum working load limit of 6500 lbs.

2.2 VALVE BOXES

A. 12 inch diameter Valves and Smaller: 5.25” diameter, domestic cast iron, two-piece, screw type.

B. Valves Larger than 12 inch diameter: Domestic cast iron, three-piece, screw type; round base.

C. Cast iron lid, marked “Water".

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 73 40 - Execution: Verification of existing conditions before starting work.

B. Determine exact location and size of valves from Drawings; obtain clarification and directions from Engineer prior to execution of work.

3.2 PREPARATION

A. Identify required lines, levels, contours and datum locations.

B. Locate, identify, and protect utilities to remain from damage.

C. Do not interrupt existing utilities without permission and without making arrangements to provide temporary utility services.

D. Perform trench excavation, backfilling and compaction in accordance with Section 31 23 17 - Trenching.

3.3 INSTALLATION

A. Install in accordance with AWWA C600.

B. Install valves in conjunction with pipe laying; set valves plumb.

C. Provide buried valves with valve boxes installed flush with finished grade. Remove all dirt and debris from inside box, install stem extension, and concrete collar as shown on the plan details

D. Provide thrust blocking and mechanical thrust restraint for valve anchorage in accordance with the drawings.

E. Install concrete or asphalt collars around valve boxes in the street per details in the plans.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Flush and disinfect system through valves in accordance with Section 33 13 00 – Disinfection of Water Utilities.

3.5 PRESSURE TESTING OF DOMESTIC WATER SYSTEM

A. Pressure test system through valves as described in Section 33 11 13 – Public Water Utility Distribution Piping.

END OF SECTION 33 12 16

SECTION 33 13 00 - DISINFECTING OF WATER UTILITY DISTRIBUTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes disinfection of potable water distribution systems and connecting services, including testing and reporting results.

B. Related Sections:
   1. Section 22 11 16 – Domestic Water Piping: Requirements for installation, testing, of building domestic water piping.
   2. Section 33 11 13 - Public Water Utility Distribution Piping
   3. Section 33 12 13 – Water Service Connections: Requirements for installation, testing, of site domestic water service piping.

1.3 REFERENCES

A. American Water Works Association:
   1. AWWA B300 - Hypochlorites.
   2. AWWA B301 - Liquid Chlorine.
   3. AWWA B302 - Ammonium Sulfate.
   4. AWWA B303 - Sodium Chlorite.
   5. AWWA C651 - Disinfecting Water Mains.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit procedures, proposed chemicals, and treatment levels for review.

C. Test Reports: Indicate results comparative to specified requirements.

D. Certificate: Certify cleanliness of water distribution system meets or exceeds specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 – Closeout Procedures: Requirements for submittals.

B. Disinfection Report:
   1. Type and form of disinfectant used.

2. Date and time of disinfectant injection start and time of completion.
3. Test locations.
4. Name of person collecting samples.
5. Initial and 24 hour disinfectant residuals in treated water in ppm for each outlet tested.
6. Date and time of flushing start and completion.
7. Disinfectant residual after flushing in ppm for each outlet tested.

C. Bacteriological Report:
1. Date issued, project name, and testing laboratory name, address, and telephone number.
2. Time and date of water sample collection.
3. Name of person collecting samples.
4. Test locations.
5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
6. Coliform bacteria test results for each outlet tested.
7. Certify water conforms, or fails to conform, to bacterial standards of authority having jurisdiction.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA C651.

B. Chlorination and dechlorination shall be performed by competent individuals knowledgeable and experienced in the operation of the necessary application and safety equipment in accordance with applicable Federal, State and Local laws and regulations. The transport, storage and handling of these materials shall be performed in accordance with Code of Federal Regulations (CFR) and OSHA.

1.7 QUALIFICATIONS

A. Testing Firm: Company specializing in testing potable water systems, certified by EPA.

B. Submit bacteriologist's signature and authority associated with testing.

PART 2 PRODUCTS

2.1 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

2.2 DE-CHLORINATION CHEMICALS

A. Calcium thiosulfate as described in AWWA C-655, or other approved by Engineer.

PART 3 EXECUTION

3.1 PREPARATION

A. Every effort shall be made to keep the water main and its appurtenances clean and dry during the installation process.

B. Perform scheduling and disinfecting activity with start-up, water pressure testing, adjusting and balancing, demonstration procedures, including coordination with related systems.

C. Verify piping system has been cleaned, inspected, pressure tested and flushed prior to disinfection.

D. Disinfection of pipelines shall not proceed until all appurtenances and any necessary sample ports have been installed.

3.2 INSTALLATION

A. Provide and attach required equipment to perform the Work of this section.

B. Perform disinfection of water lines and installation of system and pressure testing. Refer to Sections 33 11 13 - Public Water Utility Distribution Piping and 33 12 13 – Water Service Connections.

C. Inject treatment disinfectant or introduce treatment into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use potable domestic water.

F. Replace permanent system devices removed for disinfection.

3.3 FIELD QUALITY CONTROL

A. Section 01 73 40 - Execution: Field inspecting, testing, adjusting, and balancing.

B. Disinfection, Flushing, and Sampling:
   1. Disinfect pipeline installation in accordance with AWWA C651.
   2. Upon completion of retention period required for disinfection, flush pipeline until chlorine concentration in water leaving pipeline is no higher than that generally prevailing in existing system or is acceptable for domestic use.
   3. Legally dispose of chlorinated water. When chlorinated discharge may cause damage to environment, apply neutralizing chemical to chlorinated water.
   4. After final flushing and before pipeline is connected to existing system, or placed in service, employ an approved independent testing laboratory to sample, test and certify water quality suitable for human consumption. Submit testing data to Engineer.

END OF SECTION 33 13 00

SECTION 33 21 13 - PUBLIC WATER SUPPLY WELLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section Includes:
1. Submersible Vertical Turbine Pump & Motor
2. Pitless Adapters
3. Discharge Pipe & Valves

C. Related Sections:
1. Section 25 51 00 – Integrated Automation Control of Facility Equipment
2. Section 26 00 00 - Basic Electrical Requirements
3. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
4. Section 26 05 33.10 - Raceway and Boxes for Electrical Systems.
5. Section 26 05 83 – Equipment Wiring Systems
6. Section 26 24 16 – Panelboards
7. Section 26 29 23 – Variable-Frequency Motor Controllers
8. Section 33 13 00 – Disinfecting of Water Utilities
9. Section 46 31 11 - Chlorine Feed Equipment
10. Section 46 33 44 - Peristaltic Metering Pumps

1.2 REFERENCES

AWWA - American Water Works Association Standard for Submersible Vertical Turbine Pumps - AWWA E102-06

A. Wyoming Water Quality Department (WYDEQ) Water Quality Regulations Chapter 26

B. Wyoming State Engineers Office (SEO) Regulations and Instructions Part III Water Well Minimum Construction Standards

C. American Water Works Association:
1. AWWA A100 - Standard for Water Wells.
2. AWWA – AWWA E101-88 American Water Works Association Standard for Vertical Turbine Pumps – Line Shaft and Submersible Types.

D. National Electrical Manufacturers Association:
1. NEMA MG 1 - Motors and Generators.
2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 SYSTEM DESCRIPTION & CONDITIONS

A. Contractor shall install internal working components within an existing well, that including pump, motor, pressure transducer, column pipe, electrical (panels, conductors and conduit extensions) and complete startup and testing in accordance with specifications within Division 01.

B. Description of Well:
   1. Water Properties: Temperature, 47-degree F; pH - 7.2, a chlorine solution, at a maximum of 250 ppm, will be injection into Well 10 three (3) feet below the submersible motor.
   2. Diameter of well casing to pump setting - 16 in. dia. stl
   3. Total depth of well to bottom of well screen:
      a. Well No. 9 – 103 feet
      b. Well No. 10 -TBD
   4. Static water level below datum – 28 ft (April 2021)
   5. Well Pump Characteristics:
      a. Electric motor, 460 volt, 3-phase, 3600 RPM at 60 Hz
      b. Driver: Submersible Motor
      c. Pump Support: Pitless adaptor with subsurface discharge, 6 to 7-feet bury, and torque arrestor (already installed)
      d. Design capacity - 1450 gpm at 3500 RPM.
      e. TDH at design capacity: 295-ft
      f. Pump Efficiency - 79% at 1450 gpm and 295 ft TDH
      g. Datum elevation at ground level: 6122-ft
      h. Pumping level below datum at design capacity: 48-ft
      i. Pump setting (datum to inlet pump suction): 72-ft

C. Connections and Accessories:
   1. Discharge pipe - 8 in. dia. stl to 8” dia. DIP buried supply line
   2. Airline and pressure transducer required.
   3. Polyethylene Products furnished under this section shall conform to NSF/ANSI 61 Drinking Water System Components -Health Effects.

1.4 SUBMITTALS

A. Section 01340 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on all products and equipment furnished and installed. Pumps: Manufacturer, pump type and model, VFD performance curves at maximum rated and minimum operating conditions that indicate pump speed, pressure developed, horsepower requirements and capacity, bearing type and bearing life, motor data: manufacturer, type and model, nameplate horsepower, service factor, full-load current, efficiency, temperature rating of insulation, thermal over-load, materials of construction, bearing

type and bearing life, manufacturer's installation instructions, operations and maintenance information, and warranty.

1.5 CLOSEOUT SUBMITTALS

A. Section 01700 – Closeout Procedures: Requirements for submittals.

B. Pump Testing Reports competed by a pump and motor manufacturer representative. Professional Geologist or Professional Engineer licensed (Licensed Professional) in the State of Wyoming.

C. Operation and Maintenance Data: Submit equipment in accordance with Section 01730.

D. Project Record Documents: Accurately record actual locations of equipment. Assist Engineer in the completion and submittal of the Wyoming State Engineers Office Form UW 6 Statement of Completion upon well completion.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA A100.

B. Perform Work in accordance with Wyoming Department of Environmental Quality Regulations.

C. Perform Work in accordance with Wyoming State Engineers Office Regulations.

D. Field test of well pump by manufacturer’s representative shall be performed in presence of Engineer.

E. Pumps purchased under this section shall be factory inspected and tested per AWWA E 102-06

1.7 QUALIFICATIONS

A. Well Subcontractor must be licensed in the State of Wyoming with a minimum work experience of 5-yrs on similar projects

1.8 WARRANTY

A. Section 01700- Closeout Procedures: Requirements for warranties.

B. Well Pumps and Motors: Furnish 2-year manufacturer’s warranty starting from the date of initial pump startup. Manufacturer shall warrant equipment free of all faults and defects throughout the warranty period, Should equipment fail to function in normal use within this period, manufacturer shall furnish a new pump and motor at no charge. All

costs associated with shipping, pump/motor removal and replacement shall be borne by manufacture. The warranty shall be signed by the manufacturer.

PART 2 PRODUCTS

2.1 GENERAL

A. All products shall at a minimum conform to all applicable AWWA standards.

B. Products and Equipment shall be designed and constructed to withstand the hydrostatic pressures of the supply system, or 130 psi (dynamic working pressure)

C. Not all products listed below in this specification are required for this project. See drawing P1.4 for specific requirements concerning the completion of Wells 9 and 10.

2.2 SUBMERSIBLE VERTICAL TURBINE PUMP & MOTOR

A. Pump: Franklin Electric Model FST-10FYC, or accepted substitution.
   1. Comply with operating criteria in section 1.3 above.
   2. Stages: 2
   3. Column Pipe Connection: 8-inch dia.
   4. Bowl: 316 SS
   5. Trim shall accommodate flow conditions stated in Part 1.5 above.
   6. The pump load shall not exceed motor maximum nameplate amps under all running conditions, at any point on the pump curve.
   7. Strainer: A strainer shall be furnished. The strainer shall be constructed of corrosion resistant material.
   8. Pump Bowl Assembly: Bowls shall be made of close-grained cast iron, free from blow holes, sand holes or other detrimental defects, with a tensile strength of 30,000 psi. Bowls shall be internally-coated fusion bonded epoxy, vitreous enamel or approved coating. Each intermediate bowl shall be constructed with a bronze bearing to support the impeller shaft. The impeller shaft shall be made of 416 Stainless Steel. The bowls shall be equipped with replaceable seal rings on the suction side of the impeller. The impellers shall be made of lead and zinc free bronze, ASTM B584, accurately machined, finished and dynamically balanced for maximum efficiency and vibration free operation. Each impeller shall be securely fastened to the shaft. The electrical conductors shall be protected by a corrosion resistant mechanical type shield where they pass the pump bowls.

B. Motor: Franklin Electric FST-10FYC, 150 HP, 3600 rpm, 4-pole, 460V with MagForce Sand Fighter motor, or accepted substitution.
   1. Service: Submersible & VFD Rated
   2. Shell: Stainless Steel
   3. Size: 8-inch dia.
   4. Voltage Tolarance: +/-10%

5. The motor shall conform to the NEMA specifications for submersible motors. The motor shall be capable of variable speed operation through a variable frequency drive and shall be capable of continuous operation at reduced speed.
6. The power output shaft shall be 416 Stainless Steel (SAE 51416) or equivalent. All fastenings exposed to well water shall be of stainless steel or approved equivalent corrosion resistant material.
7. Submersible Cable: The power cable shall be sized such that the voltage drop will not exceed 5% from the power source to the motor's terminals at the motor's full load current and voltage.
8. Pump Motor Coupling: The pump motor coupling shall be of 416 Stainless Steel.
9. Motor Controls: Shall be as described in Section 26 29 23 – Rockwell Variable-Frequency Motor Controllers.

2.3 PITLESS ADAPTOR

A. Pitless Adaptor (already installed):
   1. Manufacture/Make: Monitor PS Pitless
   2. Pitless Size: 18-inch dia.
   3. Discharge Pipe Connection: 8-inch dia.
   4. Well Casing: 16-inch dia.
   5. Cap: Water Tight Steel Well Cap with Vent
   6. Accessories/Attachments
      a. Chlorine and Phosphate Discharges (2 ea.):
         1) Pitless: Maas Model 304 JD-SS, or approved equal.
            a) Materials: Chlorine Resistance (250 ppm CL solution)
            b) Construction: 304 Stainless Steel
            c) Seals: Viton O-rings
            d) Size: Match Chlorine Line Size per plan
            e) Pipe: DR13.5 PE4710, ASTM D1350 copper tube size (C.T.S.) outside diameter based: size per plans.
      b. Airline Test Blocks
      c. Sealed Wire Connections
      d. Torque Arrestor and Lift-Out Bail Hold Down Ring

2.4 DISCHARGE PIPE AND VALVES

A. Discharge (Column) Pipe:
   1. Size: The discharge/drop or column pipe shall be of the size shown on the drawings.
   2. Pipe: ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe with threaded ends and cast-iron or steel threaded couplings.

B. Check Valve: The column check valve shall be bronze or ductile iron designed for minimum head loss to provide a positive seal under high or low-pressure applications.
   1. Manufacturer/Make: Flomatic 80DI/SS VFD, or approved equal.
   2. Lead Free Materials

3. Operation: Variable flow for VFD controlled pumps
4. Body: Ductile Iron w/ threaded connections
5. Valve Guide: Stainless Steel.
6. Pressure Ratting: 250 psi (minimum)
7. Size: Per Plans

C. Chemical Injection Drop Pipe & Fittings
1. DR13.5 PE4710, ASTM D1350 copper tube size (C.T.S.) outside diameter based: size per plans.
2. Fittings: Stainless Steel

2.5 MISCELLANEOUS EQUIPMENT

A. Level Sensor (Submersible Level Transducer): See Section 25 30 00 - Instrumentation and Control for Process Systems

B. Pump/Motor Centralizers: Install spacers above pump and motor to keep the well centered in the casing. Spacers shall be constructed of non-corrosive materials (stainless steel, or PE), or graded steel coated with NSF approved fusion bonded epoxy primer and top coats; 3 coats at 3-5 mil/coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 1 - Execution: Verification of existing conditions before starting work.

B. Verify site conditions are capable of supporting specified equipment before performing work and pump testing operations.

3.2 PREPARATION

A. Protect structures near well from damage.

B. Well Disinfection:
1. Complete disinfection of every new, modified or reconditioned groundwater source shall be done in accordance with AWWA C654. Well disinfection in accordance with this standard includes chlorination and contamination prevention of well drilling and installation equipment, well casing, pump and motor and associated piping, the gravel pack and immediate area of the aquifer around the casing, and all other associated equipment installed within the well, as well as, verification of satisfactory bacteriological quality of the water.
2. Comply with Chapter 12 Regulations of Wyoming DEQ and Part 3.2.4.12 of the 28th Edition of Recommended Standards for Water Works (Ten States Standards).

3.3 INSTALLATION – PUMP

A. Install all equipment conforming to manufacturer and applicable published standards.

B. Electrical Connections: Refer to Division 26 – Basic Electrical Requirements.

D. Ground equipment according to Section 26 05 26 - Grounding and Bonding for Electrical Systems.

E. Connect wiring according to Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

F. Pump Installation:
   1. Secure pump lifting cable to pump. Install pump onto threaded riser pipe.
   2. Before lowering permanent pump into well, start pump to verify correct rotation.
   3. Set pump intake to casing depth detailed in the plans.
   4. Secure wiring harness to pump column at 10 foot intervals.
   5. Install Level Indicator as shown on the Plans.
   6. Securely tighten discharge piping joints.

G. Pressure Transducer and Chemical Drop Pipe Installation:
   1. Make all necessary connections and/or splices to ensure proper operation
   2. Install to the depth detailed in the plans.
   3. Secure (zip-tie) cabling and drop pipe to pump column pipe.
   4. Take extra precaution during installation to ensure equipment is not damaged during pump/column pipe installation.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. Plumbness and Alignment Testing: Comply with AWWA A100.
   2. Performance Testing: Conduct final pumping tests after wells have been constructed, cleaned, tested for plumbness and alignment, wired to controllers and programmed in accordance with Section 25 51 00. Conduct testing in the presents of the Engineer. Leads on pumps will be tested for resistance, voltage and amperage and pump speeds, flows and pressures will be recorded to ensure consistency with the Engineer's design parameters.

C. Comply with Section 01 73 40 – Execution, and the manufacturer's instructions for starting of equipment.

D. Operation of well equipment shall conform to the control narrative provided in Section 25 51 00 – Integrated Automation Control of Facility Equipment.

3.5 DEMONSTRATION AND TRAINING

A. Section 01 79 00 – Demonstration and Training: Requirements for demonstration and training.
   1. Provide minimum of 4 hours of training for well operation and associated control equipment.
   2. Equipment demonstration and training for ToJ Staff shall be in accordance with the manufacturer's operation and maintenance manual for each type of equipment. Include training on the calibration of instruments and equipment.
   3. Demonstrate SCADA system automatic control functions and alarms for each type of equipment. Operation of equipment shall comply with control narratives provided in Section 25 51 00 – Integrated Automation Control of Facility Equipment.

3.6 DISINFECTION AND CLEANING

A. Section 01700– Closeout Procedures: Requirements for cleaning.

B. Concerning well disinfection, comply with Part 3.2.B, above.

C. Flush, disinfect and pressure test all equipment installed in accordance with Sections 33 11 13 - Public Water Utility Distribution Piping and 33 13 00 – Disinfecting of Water Utilities.

END OF SECTION

SECTION 40 05 13 - COMMON WORK RESULTS FOR PROCESS PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe penetrations.
2. Restrained joints.
3. Flexible connections.
4. Expansion joints.
5. Expansion loops.
6. Sleeve-type couplings.
7. Air release and vacuum breakers.
8. Strainers.
9. Service Saddles

B. Related Requirements:
1. Section 09 96 00 – High-Performance Coatings: Product and execution requirements for painting specified by this Section.
2. Section 33 13 00 - Disinfecting of Water Utility Distribution: Disinfection of potable water piping.
3. Section 40 05 13.13 - Steel Process Piping: Steel piping materials and appurtenances.
4. Section 40 05 13.53 – Ductile Iron Process Piping: Ductile-iron piping materials and appurtenances.
5. Section 40 05 13.73 - Plastic Process Piping: Plastic piping materials and appurtenances.
6. Section 40 05 23 - Common Work Results for Process Valves: Common product requirements for valves for placement by this Section.
7. Section 40 05 29 - Hangers and Supports for Process Piping and Equipment: Hangers, anchors, sleeves, and sealing of piping to adjacent structures.

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
1. ASME BPV Code: Section IX - Welding and Brazing Qualifications.
2. ASME A13.1 - Scheme for Identification of Piping Systems.
3. ASME B31.9 - Building Services Piping.

B. ASTM International:
1. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
2. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
3. ASTM F1199 - Standard Specification for Cast (All Temperatures and Pressures) and Welded Pipe Line Strainers (150 psig and 150°F Maximum).
4. ASTM F1200 - Standard Specification for Fabricated (Welded) Pipe Line Strainers (Above 150 psig and 150°F).

C. American Welding Society:

SECTION 33 21 13 - PUBLIC WATER SUPPLY WELLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Section Includes:
   1. Submersible Vertical Turbine Pump & Motor
   2. Pitless Adapters
   3. Discharge Pipe & Valves

C. Related Sections:
   1. Section 25 51 00 – Integrated Automation Control of Facility Equipment
   2. Section 26 00 00 - Basic Electrical Requirements
   3. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
   4. Section 26 05 33.10 - Raceway and Boxes for Electrical Systems.
   5. Section 26 05 83 – Equipment Wiring Systems
   6. Section 26 24 16 – Panelboards
   7. Section 26 29 23 – Variable-Frequency Motor Controllers
   8. Section 33 13 00 – Disinfecting of Water Utilities
   9. Section 46 31 11 - Chlorine Feed Equipment
   10. Section 46 33 44 - Peristaltic Metering Pumps

1.2 REFERENCES

AWWA - American Water Works Association Standard for Submersible Vertical Turbine Pumps - AWWA E102-06

A. Wyoming Water Quality Department (WYDEQ) Water Quality Regulations Chapter 26

B. Wyoming State Engineers Office (SEO) Regulations and Instructions Part III Water Well Minimum Construction Standards

C. American Water Works Association:
   1. AWWA A100 - Standard for Water Wells.
   2. AWWA – AWWA E101-88 American Water Works Association Standard for Vertical Turbine Pumps – Line Shaft and Submersible Types.

D. National Electrical Manufacturers Association:
   1. NEMA MG 1 - Motors and Generators.
   2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 SYSTEM DESCRIPTION & CONDITIONS

A. Contractor shall install internal working components within an existing well, that including pump, motor, pressure transducer, column pipe, electrical (panels, conductors and conduit extensions) and complete startup and testing in accordance with specifications within Division 01.

B. Description of Well:
   1. Water Properties: Temperature, 47-degree F; pH - 7.2, a chlorine solution, at a maximum of 250 ppm, will be injection into Well 10 three (3) feet below the submersible motor.
   2. Diameter of well casing to pump setting - 16 in. dia. stl
   3. Total depth of well to bottom of well screen:
      a. Well No. 9 – 103 feet
      b. Well No. 10 -TBD
   4. Static water level below datum – 28 ft (April 2021)
   5. Well Pump Characteristics:
      a. Electric motor, 460 volt, 3-phase, 3600 RPM at 60 Hz
      b. Driver: Submersible Motor
      c. Pump Support: Pitless adaptor with subsurface discharge, 6 to 7-feet bury, and torque arrestor (already installed)
      d. Design capacity - 1450 gpm at 3500 RPM.
      e. TDH at design capacity: 295-ft
      f. Pump Efficiency - 79% at 1450 gpm and 295 ft TDH
      g. Datum elevation at ground level: 6122-ft
      h. Pumping level below datum at design capacity: 48-ft
      i. Pump setting (datum to inlet pump suction): 72-ft

C. Connections and Accessories:
   1. Discharge pipe - 8 in. dia. stl to 8” dia. DIP buried supply line
   2. Airline and pressure transducer required.
   3. Polyethylene Products furnished under this section shall conform to NSF/ANSI 61 Drinking Water System Components -Health Effects.

1.4 SUBMITTALS

A. Section 01340 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit data on all products and equipment furnished and installed. Pumps: Manufacturer, pump type and model, VFD performance curves at maximum rated and minimum operating conditions that indicate pump speed, pressure developed, horsepower requirements and capacity, bearing type and bearing life, motor data: manufacturer, type and model, nameplate horsepower, service factor, full-load current, efficiency, temperature rating of insulation, thermal over-load, materials of construction, bearing type and bearing life, manufacturer's installation instructions, operations and maintenance information, and warranty.

1.5 CLOSEOUT SUBMITTALS

A. Section 01700 – Closeout Procedures: Requirements for submittals.

B. Pump Testing Reports competed by a pump and motor manufacturer representative. Professional Geologist or Professional Engineer licensed (Licensed Professional) in the State of Wyoming.

C. Operation and Maintenance Data: Submit equipment in accordance with Section 01730.

D. Project Record Documents: Accurately record actual locations of equipment. Assist Engineer in the completion and submittal of the Wyoming State Engineers Office Form UW 6 Statement of Completion upon well completion.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with AWWA A100.

B. Perform Work in accordance with Wyoming Department of Environmental Quality Regulations.

C. Perform Work in accordance with Wyoming State Engineers Office Regulations.

D. Field test of well pump by manufacturer's representative shall be performed in presence of Engineer.

E. Pumps purchased under this section shall be factory inspected and tested per AWWA E 102-06

1.7 QUALIFICATIONS

A. Well Subcontractor must be licensed in the State of Wyoming with a minimum work experience of 5-yrs on similar projects

1.8 WARRANTY

A. Section 01700- Closeout Procedures: Requirements for warranties.

B. Well Pumps and Motors: Furnish 2-year manufacturer's warranty starting from the date of initial pump startup. Manufacturer shall warrant equipment free of all faults and defects throughout the warranty period, Should equipment fail to function in normal use within this period, manufacturer shall furnish a new pump and motor at no charge. All costs associated with shipping, pump/motor removal and replacement shall be borne by manufacture. The warranty shall be signed by the manufacturer.

PART 2 PRODUCTS

2.1 GENERAL

A. All products shall at a minimum conform to all applicable AWWA standards.

B. Products and Equipment shall be designed and constructed to withstand the hydrostatic pressures of the supply system, or 130 psi (dynamic working pressure)

2.2 SUBMERSIBLE VERTICAL TURBINE PUMP & MOTOR

A. Pump: Franklin Electric Model FST-10FYC, or accepted substitution.
   1. Comply with operating criteria in section 1.3 above.
   2. Stages: 2
   3. Column Pipe Connection: 8-inch dia.
   4. Bowl: 316 SS
   5. Trim shall accommodate flow conditions stated in Part 1.5 above.
   6. The pump load shall not exceed motor maximum nameplate amps under all running conditions, at any point on the pump curve.
   7. Strainer: A strainer shall be furnished. The strainer shall be constructed of corrosion resistant material.
   8. Pump Bowl Assembly: Bowls shall be made of close-grained cast iron, free from blow holes, sand holes or other detrimental defects, with a tensile strength of 30,000 psi. Bowls shall be internally-coated fusion bonded epoxy, vitreous enamel or approved coating. Each intermediate bowl shall be constructed with a bronze bearing to support the impeller shaft. The impeller shaft shall be made of 416 Stainless Steel. The bowls shall be equipped with replaceable seal rings on the suction side of the impeller. The impellers shall be made of lead and zinc free bronze, ASTM B584, accurately machined, finished and dynamically balanced for maximum efficiency and vibration free operation. Each impeller shall be securely fastened to the shaft. The electrical conductors shall be protected by a corrosion resistant mechanical type shield where they pass the pump bowls.

B. Motor: Franklin Electric FST-10FYC, 150 HP, 3600 rpm, 4-pole, 460V with MagForce Sand Fighter motor, or accepted substitution.
   1. Service: Submersible & VFD Rated
   2. Shell: Stainless Steel
   3. Size: 8-inch dia.
   4. Voltage Tolarance: +/-10%
   5. The motor shall conform to the NEMA specifications for submersible motors. The motor shall be capable of variable speed operation through a variable frequency drive and shall be capable of continuous operation at reduced speed.

6. The power output shaft shall be 416 Stainless Steel (SAE 51416) or equivalent. All fastenings exposed to well water shall be of stainless steel or approved equivalent corrosion resistant material.
7. Submersible Cable: The power cable shall be sized such that the voltage drop will not exceed 5% from the power source to the motor's terminals at the motor's full load current and voltage.
8. Pump Motor Coupling: The pump motor coupling shall be of 416 Stainless Steel.
9. Motor Controls: Shall be as described in Section 26 29 23 – Rockwell Variable-Frequency Motor Controllers.

2.3 PITLESS ADAPTOR

A. Pitless Adaptor (already installed):
   1. Manufacture/Make: Monitor PS Pitless
   2. Pitless Size: 18-inch dia.
   3. Discharge Pipe Connection: 8-inch dia.
   4. Well Casing: 16-inch dia.
   5. Cap: Water Tight Steel Well Cap with Vent
   6. Accessories/Attachments
      a. Chlorine and Phosphate Discharges (2 ea.):
         1) Pitless: Maas Model 304 JD-SS, or approved equal.
            a) Materials: Chlorine Resistance (250 ppm CL solution)
            b) Construction: 304 Stainless Steel
            c) Seals: Viton O-rings
            d) Size: Match Chlorine Line Size per plan
            e) Pipe: DR13.5 PE4710, ASTM D1350 copper tube size (C.T.S.) outside diameter based: size per plans.
      b. Airline Test Blocks
      c. Sealed Wire Connections
      d. Torque Arrestor and Lift-Out Bail Hold Down Ring

2.4 DISCHARGE PIPE AND VALVES

A. Discharge (Column) Pipe:
   1. Size: The discharge/drop or column pipe shall be of the size shown on the drawings.
   2. Pipe: ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe with threaded ends and cast-iron or steel threaded couplings.

B. Check Valve: The column check valve shall be bronze or ductile iron designed for minimum head loss to provide a positive seal under high or low-pressure applications.
   1. Manufacturer/Make: Flomatic 80DI/SS VFD, or approved equal.
   2. Lead Free Materials
   3. Operation: Variable flow for VFD controlled pumps
   4. Body: Ductile Iron w/ threaded connections
   5. Valve Guide: Stainless Steel.

6. Pressure Ratting: 250 psi (minimum)
7. Size: Per Plans

C. Chemical Injection Drop Pipe & Fittings
1. DR13.5 PE4710, ASTM D1350 copper tube size (C.T.S.) outside diameter based: size per plans.
2. Fittings: Stainless Steel

2.5 MISCELLANEOUS EQUIPMENT

A. Level Sensor (Submersible Level Transducer): See Section 25 30 00 - Instrumentation and Control for Process Systems

B. Pump/Motor Centralizers: Install spacers above pump and motor to keep the well centered in the casing. Spacers shall be constructed of non-corrosive materials (stainless steel, or PE), or graded steel coated with NSF approved fusion bonded epoxy primer and top coats; 3 coats at 3-5 mil/coat.

PART 3 EXECUTION

3.1 EXAMINATION

A. Division 1 - Execution: Verification of existing conditions before starting work.

B. Verify site conditions are capable of supporting specified equipment before performing work and pump testing operations.

3.2 PREPARATION

A. Protect structures near well from damage.

3.3 INSTALLATION – PUMP

A. Install all equipment conforming to manufacturer and applicable published standards.

B. Electrical Connections: Refer to Division 26 – Basic Electrical Requirements.

D. Ground equipment according to Section 26 05 26 - Grounding and Bonding for Electrical Systems.

E. Connect wiring according to Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

F. Pump Installation:
1. Secure pump lifting cable to pump. Install pump onto threaded riser pipe.
2. Before lowering permanent pump into well, start pump to verify correct rotation.

3. Set pump intake to casing depth detailed in the plans.
4. Secure wiring harness to pump column at 10 foot intervals.
5. Install Level Indicator as shown on the Plans.
6. Securely tighten discharge piping joints.

G. Pressure Transducer and Chemical Drop Pipe Installation:
1. Make all necessary connections and/or splices to ensure proper operation
2. Install to the depth detailed in the plans.
3. Secure (zip-tie) cabling and drop pipe to pump column pipe.
4. Take extra precaution during installation to ensure equipment is not damaged during pump/column pipe installation.

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
1. Plumbness and Alignment Testing: Comply with AWWA A100.
2. Performance Testing: Conduct final pumping tests after wells have been constructed, cleaned, tested for plumbness and alignment, wired to controllers and programmed in accordance with Section 25 51 00. Conduct testing in the presents of the Engineer. Leads on pumps will be tested for resistance, voltage and amperage and pump speeds, flows and pressures will be recorded to ensure consistency with the Engineer's design parameters.

C. Comply with Section 01 73 40 – Execution, and the manufacturer's instructions for starting of equipment.

D. Operation of well equipment shall conform to the control narrative provided in Section 25 51 00 – Integrated Automation Control of Facility Equipment.

3.5 DEMONSTRATION AND TRAINING

A. Section 01 79 00 – Demonstration and Training: Requirements for demonstration and training.
1. Provide minimum of 4 hours of training for well operation and associated control equipment.
2. Equipment demonstration and training for ToJ Staff shall be in accordance with the manufacturer's operation and maintenance manual for each type of equipment. Include training on the calibration of instruments and equipment.
3. Demonstrate SCADA system automatic control functions and alarms for each type of equipment. Operation of equipment shall comply with control narratives provided in Section 25 51 00 – Integrated Automation Control of Facility Equipment.

3.6 CLEANING

A. Section 01700– Closeout Procedures: Requirements for cleaning.

B. Flush, disinfect and pressure test all equipment installation in accordance with Sections 33 11 13 - Public Water Utility Distribution Piping and 33 13 00 – Disinfecting of Water Utilities.

END OF SECTION

1. AWS D1.1 - Structural Welding Code - Steel.

D. American Water Works Association:
   1. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   2. AWWA C219 - Bolted, Sleeve-Type Couplings for Plain-End Pipe.

E. Expansion Joint Manufacturers Association, Inc.:
   1. EJMA Standards.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly, placed in spaces between and penetrations through building materials, to arrest movement of fire, smoke, heat, and hot gases through fire-rated construction.

B. FM: Factory Mutual Insurance Company. "FM Global" is the communicative name of the company.

C. WH: Warnock Hersey; indicating compliance to relevant building codes, association criteria, and product safety and performance standards.

1.4 COORDINATION

A. Coordinate installation of specified items with piping and equipment installation.

1.5 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Submittal procedures.

B. Product Data:
   1. Submit manufacturer's catalog information for each product specified.
   2. Firestopping: Submit data on product characteristics, performance, and limitation criteria.
   3. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
   4. Expansion Joints: Indicate maximum temperature, pressure rating, and expansion compensation.

C. Shop Drawings:
   1. Submit list of wording, symbols, letter size, and color coding for pipe identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
   2. Indicate restrained joint details and materials being utilized. Submit layout drawings showing piece numbers and locations. Indicate restrained joint locations.
   3. Indicate layout of piping systems, including flexible connectors, expansion joints, expansion compensators, loops, offsets, and swing joints.
   4. Firestopping Schedule: Submit schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire-resistance rating of adjacent assembly.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Welders' Certificate: Submit welders' certification of compliance with verifying qualification within previous 12 months.

F. Manufacturer's Instructions: Submit special procedures and setting dimensions.

1.6 QUALITY ASSURANCE

A. Perform Work according to ASME Section IX for welding materials and procedures and according to AWS D1.1 for welding procedures used to fabricate pipe.

B. Perform Work according to ASME B31.9 code for installation of piping systems.

C. Through-Penetration Firestopping of Fire-Rated Assemblies: ASTM E814 with 0.1-inch-wg minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1 hour.
   1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1 hour.
   2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1 hour.
      a. Floor Penetrations within Wall Cavities: T-Rating is not required.

D. Through-Penetration Firestopping of Non-fire-rated Floor Assemblies: Materials to resist free passage of flame and products of combustion.

E. Fire-Resistant Joints in Fire-Rated Floor, Roof, and Wall Assemblies: UL 2079 to achieve fire-resistant rating as indicated on Drawings for assembly in which joint is installed.

F. Fire-Resistant Joints between Floor Slabs and Exterior Walls: ASTM E119 with 0.1-inch-wg minimum positive pressure differential to achieve fire-resistant rating as indicated on Drawings for floor assembly.

G. Surface-Burning Characteristics: Maximum 25/450 flame-spread/smoke-developed index when tested according to ASTM E84.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Furnish temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

1.8 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Do not install underground piping when bedding is frozen.

1.9 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 PIPE PENETRATIONS

A. Performance and Design Criteria:
   1. Firestopping Materials:
      a. ASTM E814 to achieve fire ratings:
         1) of adjacent construction.
   2. Firestop interruptions to fire-rated assemblies, materials, and components.

B. Flashing:
   1. Metal Flashing: 26 gage galvanized steel.
   2. Metal Counterflashing: 22 gage galvanized steel.
   3. Lead Flashing:
      a. Waterproofing: 5 psf sheet lead.
      b. Soundproofing: 1 psf sheet lead.
   4. Flexible Flashing Materials: 47 mil-thick sheet butyl, compatible with roofing.
   5. Caps: Steel, 22-gage minimum; 16 gage at fire-resistant elements.

C. Sleeves:
   1. Sleeves for Pipes through Non-fire-rated Floors: 18-gage galvanized steel.
   2. Sleeves for Pipes through Non-fire-rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.
   3. Sealant: conform to Section 07 92 00 - Joint Sealants.

D. Mechanical Sleeve Seals:
   1. Manufacturer List:
      a. EnPRo Industies, GPT, Link-Seal.
      b. Advance Poducts & Systems, Inc., Innerlynx.
      c. Metraflex, MetraSeal.
      d. Substitutions: Section 01 67 00 - Product Requirements.
   2. Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

E. Water Seals
   1. Manufacturer List:
      a. Aquafin, Waterstop-Strip
      b. Substitutions: Section 01 67 00 - Product Requirements.
   2. Description: Hydrophilic swelling (expanding) rubber for installation at cold joints and use in conjunction with mechanical sleeve seals used for pipe wall and slab penetrations.

2.2 RESTRAINED JOINTS

A. Pressure Piping Tied Joint Restraint System.
   1. Mechanical joint with restraint device:
      a. Multiple wedging action type
      b. Twist off nuts used to insure proper actuating of the restraining device
      c. Working pressure rated to at least 250 psi
      d. EBAA Iron Sales, Inc., MEGA LUG or approved equal.
   2. Restraint Couplers
      a. Working pressure rated to at least 250 psi
      b. Romac Alpha, or approved equal.

2.3 FLEXIBLE CONNECTIONS

A. Steel Piping:
   1. Inner Hose: Stainless steel.
   2. Exterior Sleeve: Double-braided.
   3. Pressure Rating: 125 psig WSP and 450 degrees F.
   4. Joints: As specified for pipe joints.
   5. Size: Use pipe-sized units.
   6. Maximum Offset: 1 inch on each side of installed center line.

B. Copper Piping:
   1. Inner Hose: Bronze.
   2. Exterior Sleeve: Braided bronze.
   3. Pressure Rating: 200 psig WOG and 250 degrees F.
   4. Joints: As specified for pipe joints.
   5. Size: Use pipe-sized units.
   6. Maximum Offset: 3/4 inch on each side of installed center line.

2.4 EXPANSION JOINTS

A. Performance and Design Criteria:
   1. Bellow Design: Conform to Section C of EJMA Standards.

B. Stainless-Steel-Bellows Type:
   1. Pressure Rating: 125 psig WSP and 400 degrees F.
   2. Maximum Compression: 1-1/4 inch.
   3. Maximum Extension: 1/4 inch.
   4. Joint: As specified for pipe joints.
   5. Size: Use pipe-sized units.

6. Application: Steel piping 3 inch and smaller.

C. External Ring-Controlled Stainless-Steel-Bellows Type:
   1. Pressure Rating: 125 psig WSP and 400 degrees F.
   2. Maximum Compression: 1-1/4 inch.
   3. Maximum Extension: 3/8 inch.
   4. Maximum Offset: 5/16 inch.
   5. Joint: Flanged.
   6. Size: Use pipe-sized units.
   7. Accessories: Internal flow liner.
   8. Application: Steel piping 3 inches and larger.

D. Double-Sphere Flexible Compensators:
   1. Body: PTFE.
   2. Working Pressure: 75 psig.
   3. Maximum Temperature: 400 degrees F.
   4. Maximum Compression: 3/4 inch.
   5. Maximum Elongation: 1/2 inch.
   6. Maximum Offset: 1/2 inch.
   7. Maximum Angular Movement: 15 degrees.
   8. Joint:Tapped steel flanges.
   9. Size: Use pipe-sized units.
   10. Accessories: Control rods.
   11. Application: Steel piping 2 inch and larger.

E. Two-Ply Bronze-Bellows Type:
   1. Construction: Bronze with anti-torque device, limit stops, internal guides.
   2. Pressure Rating: 125 psig WSP and 400 degrees F.
   3. Maximum Compression: 1-3/4 inch.
   4. Maximum Extension: 1/4 inch.
   5. Size: Use pipe-sized units.
   6. Application: Copper piping.

F. Low-Pressure Compensators with Two-Ply Bronze Bellows:
   1. Working Pressure: 75 psig.
   2. Maximum Temperatures: 400 degrees F.
   3. Maximum Compression: 1/2 inch.
   4. Maximum Extension: 5/32 inch.
   5. Joint: Soldered.
   6. Size: Use pipe-sized units.
   7. Application: Copper or steel piping 2 inch and smaller.

G. Copper with Packed Sliding Sleeve:
   1. Maximum Temperature: 250 degrees F.
   2. Joint: As specified for pipe joints.
   3. Size: Use pipe-sized units.
   4. Application: Copper or steel piping 2 inch and larger.

2.5 EXPANSION LOOPS

A. Provide expansion loops as indicated on Drawings and/or Shop Drawings.

2.6 SLEEVE-TYPE COUPLINGS

A. AWWA C219; steel middle ring; steel followers; wedge section gaskets; steel bolts, AWWA C111 (A21.11).

B. Gaskets: Nitrile rubber (Buna N); ASTM D2000; compatible with service conditions.

C. Buried Couplings: Factory epoxy coated.

2.7 AIR RELEASE AND VACUUM BREAKERS

A. Air Release Valves (Water):
   1. Manufacturer/Make: Valmatic, Crispin, or approved equal.
   2. Standard: ANSI/AWWA C512
   3. Size: As indicated on Drawings
   4. End Connections: As indicated on Drawings

B. Air and Vacuum Valves (Water):
   1. Size: As indicated on Drawings.
   2. End Connections: Threaded for 1/2 to 3 inches, flanged for end connections 4 inches and larger to match connecting pipe.
   3. Materials: Bronze or Cast iron body and cover; Type 316 stainless-steel float, seat, and trim.
   4. Working Pressure: 150psig.

2.8 STRAINERS

A. Description:
   1. ASTM F1199.
   2. Body: Welded steel; flanged ends.
   3. Pressure Rating: Minimum 150 psig.
   4. Screen:
      a. Heavy gage Type 316 stainless steel.
      b. 30 mesh.
      c. Free Area: Minimum three times pipe cross-sectional area.

2.9 SERVICE SADDLES

A. Description:
   1. Manufacturer/Make: Smith Blair Model 317
   2. Size: See Plans
   3. Body: Epoxy Coated Ductile Iron
   4. Restraint Hardware: Two (2) stainless steel bands with
   5. Connections: Tapper cc outlet threads

2.10 INSULATION

A. As indicated on Drawings and/or on Shop Drawings.

2.11 FINISHES

A. Prepare piping appurtenances for field finishes as specified in Section 09 96 00 – High-Performance Coatings.

2.12 SOURCE QUALITY CONTROL

A. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
   1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field dimensions are as indicated on Drawings and/or Shop Drawings.

B. Inspect existing flanges for nonstandard bolt-hole configurations or design, and verify that new pipe and flanges mate properly.

C. Verify that openings are ready to receive sleeves and firestopping.

D. Verify that pipe plain ends to receive sleeve-type couplings are smooth and round for 12 inches from pipe ends, and that pipe outside diameter conforms to sleeve manufacturer's requirements.

3.2 PREPARATION

A. Thoroughly clean end connections before installation.

B. Close pipe and equipment openings with caps or plugs during installation.

C. Surface Preparation: Clean surfaces to remove foreign substances.

3.3 INSTALLATION

A. Install Work according to ASME B31.9.

B. Coating: Finish piping appurtenances with Epoxy as specified in Section 09 96 00 – High-Performance Coatings for service conditions.

C. Pipe Penetrations:
   1. Flashing:

a. Provide flexible flashing and metal counterflashing where piping penetrates weatherproofed or waterproofed walls, floors, and roofs.
b. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36-by-36-inch sheet size. Fasten flashing to drain clamp device.

2. Sleeves:
   a. Exterior Watertight Entries: Seal with mechanical sleeve seals.
   b. Set sleeves in position in forms. Provide reinforcing around sleeves.
   c. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
   d. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.
   e. Where piping penetrates floor, ceiling, or wall, close off space between pipe and adjacent Work with firestopping insulation and caulk airtight. Provide close-fitting metal collar or escutcheon covers at both sides of penetration.
   f. Install stainless-steel escutcheons at finished surfaces.

D. Firestopping:
1. Install material at fire-rated construction perimeters and openings containing penetrating sleeves, piping, and other items requiring firestopping.
2. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
3. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating, to uniform density and texture.
4. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
5. Remove dam material after firestopping material has cured.
6. Fire-Rated Surface:
   a. Seal opening.
   b. Install sleeve through opening and extend beyond minimum of 1 inch on both sides of building element.
   c. Size sleeve, allowing minimum of 1 inch void between sleeve and building element.
   d. Pack void with backing material.
   e. Seal ends of sleeve with UL-listed, fire-resistive silicone compound to meet fire rating of structure penetrated.
7. Non-rated Surfaces:
   a. Seal opening through non-fire-rated opening.
   b. Install sleeve through opening and extend beyond minimum of 1 inch on both sides of building element.
   c. Size sleeve, allowing minimum of 1 inch void between sleeve and building element.
   d. Install type of firestopping material recommended by manufacturer.
   e. Install floor plates or ceiling plates where conduit penetrates non-fire-rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and rooms where penetration occurs below finished ceiling.
   f. Exterior Wall Openings below Grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, according to manufacturer's instructions.
   g. Interior Partitions: Seal pipe penetrations at clean rooms, laboratories, computer rooms , telecommunication rooms and data rooms. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

E. Restrained Joints: As specified by restrained joint manufacture.

F. Flexible Connections: Install flexible couplings at connections to equipment and where indicated on Drawings and/or Shop Drawings.

G. Expansion Joints:
   1. Install flexible couplings and expansion joints at connections to equipment and where indicated on Drawings and/or Shop Drawings.
   2. If expansion joint is supplied with internal sleeve, indicate flow direction on outside of joint.

H. Air Release and Vacuum Breakers: Provide vacuum breakers on all tanks and process equipment as indicated on Drawings and/or as indicated on Shop Drawings.

I. Backflow Preventers:
   1. Install with nameplate and test cock accessible.
   2. Install according to local code requirements and manufactures recommendations.

J. Install insulation as indicated on Drawings and/or on Shop Drawings.

K. Disinfection: Disinfect potable water piping as specified in Section 33 13 00 - Disinfecting of Water Utility Distribution.

3.4 FIELD QUALITY CONTROL

A. After installation, inspect for proper supports and interferences.

B. Repair damaged coatings with material equal to the original coating in accordance with manufacturer's recommendations.

3.5 CLEANING

A. Keep equipment interior clean as installation progresses.

END OF SECTION 40 05 13

SECTION 40 05 13.53 – DUCTILE IRON PROCESS PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Ductile iron pipe and fittings.
   2. Accessories.

B. Related Requirements:

   1. Section 09 96 00 - High-Performance Coatings: Fluid-applied coatings for corrosion resistance.
   2. Section 33 11 16 - Site Water Utility Distribution Piping: Requirements for buried service.
   3. Section 40 05 13 - Common Work Results for Process Piping: Piping components, appurtenances, and identification requirements common to process piping systems.
   4. Section 40 05 29 - Hangers and Supports for Process Piping and Equipment: Hangers, anchors, sleeves, and sealing of piping to adjacent structures.
   5. Section 40 05 23 - Common Work Results for Process Valves: Common product requirements for valves for placement by this Section.

1.2 REFERENCE STANDARDS

A. American Water Works Association:
   1. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
   2. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems.
   3. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings.
   4. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
   5. AWWA C150/A21.50 - Thickness Design of Ductile-Iron Pipe.
   6. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast.
   7. AWWA C153/A21.53 - Ductile-Iron Compact Fittings.
   8. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances.

1.3 COORDINATION

A. Coordinate Work of this Section with piping and equipment connections specified in other Sections and indicated on Drawings.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit manufacturer's catalog information on pipe materials and fittings.

C. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, sizes, and materials lists.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Qualifications Statements:

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's packaging, including handling instructions.

B. Inspection: Accept piping and appurtenances on-Site. Inspect for damage.

C. Store piping and appurtenances according to manufacturer's instructions.

D. Protect piping and appurtenances from oxidation by storing off the ground.

1.6 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

1.7 RECORD DRAWINGS

A. Comply with Section 01 77 00 – Closeout Procedures.

B. A separate set of project drawings shall be maintained at the job site at all times and shall be used as record drawings. This set shall be kept up to date with all changes and/or additions in the construction of piping and associated valves and equipment. This set of drawings shall be kept clean and protected at all times and shall be submitted to the Engineer for approval following final completion.

PART 2 PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

A. Manufacturer List:
   1. Griffin Pipe Products Company
   2. Tyler Pipe
   3. U.S. Pipe and Foundry
   4. Substitutions: Section 01 67 00 - Product Requirements.

B. Piping:
   1. AWWA C151.
   2. Diameter and Class: Diameter as indicated on drawings minimum Pressure Class 350.

C. Joints:
   1. Pressure Rating: Minimum 125 or as indicated on Drawings.
   2. Mechanical Joints:
      a. AWWA C110 and AWWA C111.
      b. Glands: Ductile iron with asphaltic coating.

3. Push-on Joints:
    a. AWWA C111.
4. Restrained Joints:
    a. AWWA C111.
5. Flanged Joints:
    a. AWWA C110.

D. Fittings:
1. AWWA C110, ductile iron
2. Cement-mortar lining, AWWA C104; standard thickness.
3. Outside Coating:
    a. Buried Service: Asphaltic; 0.04 thick.
    b. Exposed Service: As specified in Section 09 96 00 - High-Performance Coatings .
4. Pressure Rating, Pipes 12 in and Smaller: 250 psig .
5. Flanged Fittings:
    a. AWWA C110.
    b. Pressure Rating: 150 psig.

2.2 FINISHES

A. Inside Coating/Lining: Cement-mortar lining, AWWA C104; standard thickness.

B. Outside Coating:
1. Buried: Asphaltic; 1 mil thick.
2. Exposed: Primed and epoxy coated as specified in Section 09 96 00 - High-Performance Painting and Coating.

2.3 ACCESSORIES

A. Gaskets: Rubber.

B. Dielectric Fittings: Provide between dissimilar metals.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 77 00 - Execution and Closeout Requirements for installation examination.

B. Verify that field dimensions are as indicated on Shop Drawings.

C. Inspect existing flanges for nonstandard bolt hole configurations or design, and verify that new pipe and flange mate properly.

3.2 PREPARATION

A. Thoroughly clean pipe and fittings before installation.

B. Surface Preparation:
   1. Touch up shop-primed surfaces with primer as specified in Section 09 96 00 - High-Performance Coatings.
   2. Solvent-clean surfaces that are not shop primed.
   3. Clean surfaces to remove loose rust, mill scale, and other foreign substances by power wire brushing; prime 09 96 00 - High-Performance Coatings.

3.3 INSTALLATION

A. Buried Service:

B. Install pipe as specified in Section 33 11 16 - Site Water Utility Distribution Piping.

C. Exposed Service:
   1. Run piping straight along alignment indicated on Drawings and Shop Drawings with minimum number of joints.
   2. Install according to ASME B31.3.
   3. Fittings:
      a. Clean gasket seats thoroughly, and wipe gaskets clean prior to installation.
      b. Install fittings according to manufacturer's instructions.
      c. Tighten bolts progressively, drawing up bolts on opposite sides until bolts are uniformly tight; use torque wrench to tighten bolts to manufacturer's recommendations.
   4. Provide required upstream and downstream clearances from devices as indicated.

D. Make taps to ductile iron piping only with service saddle, tapping boss of a fitting or valve body, or equipment casting.

E. Install piping with sufficient slopes for venting or drainage of liquids and condensate to low points.

F. Support piping as specified in Section 40 05 29 - Hangers and Supports for Process Piping and Equipment.

G. Provide expansion joints as specified in Section 40 05 13 - Common Work Results for Process Piping and pipe guides as specified in Section 40 05 29 - Hangers and Supports for Process Piping and Equipment to compensate for pipe expansion due to temperature differences.

H. Field Cuts: According to pipe manufacturer's recommendations.

I. Finish primed surfaces with epoxy coating in accordance with Section 09 96 00 – High Performance Coatings.

3.4 FIELD QUALITY CONTROL

A. Inspect for damage to pipe lining or coating, or other defects that may be detrimental as determined by the Architect/Engineer. Repair damaged piping, or provide new undamaged pipe.

B. Pressure Testing:

1. According to AWWA C600 and the following:
    a. Test Pressure: Not less than 1½ times the working pressure or 100 psi , whichever is greater.
    b. Conduct hydrostatic test for at least two hours.
    c. Fill section to be tested with water slowly; expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure.
    d. Observe joints, fittings, and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
    e. Correct visible deficiencies and continue testing at same test pressure for additional two hours to determine there are no leaks.

C. After installation, inspect for proper supports and interferences.

3.5 CLEANING

A. Keep pipe interior clean as installation progresses.

B. Clean pipe interior of soil, grit, loose mortar, and other debris after pipe installation.

END OF SECTION 40 05 13.53

SECTION 40 05 13.73 - PLASTIC PROCESS PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. PVC pipe, tube, and fittings.
2. Chlorinated polyvinyl chloride (CPVC) pipe and fittings.
3. Polyvinylidene fluoride (PVDF) pipe, tube, and fittings.
4. Acrylonitrile-butadiene-styrene (ABS) pipe and fittings.
5. Polyethylene (PE) pipe, tube, and fittings.
6. Crosslinked Polyethylene (PEX) Tubing and fittings.
7. Accessories for plastic piping and fittings.

B. Related Requirements:
1. Section 33 11 16 - Site Water Utility Distribution Piping: Pipe laying requirements and tolerances, excavation, backfill, and thrust restraints.
2. Section 40 05 13 - Common Work Results for Process Piping: Piping components, appurtenances, and identification requirements common to process piping systems.
3. Section 40 05 23 - Common Work Results for Process Valves: Common product requirements for valves for placement by this Section.
4. Section 40 05 29 - Hangers and Supports for Process Piping and Equipment: Hangers, anchors, sleeves, and sealing of piping to adjacent structures.

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
1. ASME B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).
2. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
3. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800
4. ASME B16.5 - Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
5. ASME B16.20 - Metallic Gaskets for Pipe Flanges.
6. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges.
7. ASME B31.3 - Process Piping Guide.

B. ASTM International:
1. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
2. ASTM A194 - Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
3. ASTM D1527 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80.
4. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
5. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

6. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
7. ASTM D2464 - Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
8. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
9. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
10. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
11. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe.
12. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
13. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing.
14. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
15. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.
16. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
17. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
18. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
19. ASTM D3892 - Standard Practice for Packaging/Packing of Plastics.
20. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
21. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40
22. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
23. ASTM F441 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
24. ASTM F442 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
25. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
26. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
27. ASTM F656 - Standard Specification for Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
28. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
29. ASTM F876 - Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
30. ASTM F1055 - Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.
31. ASTM F1290 - Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings.

C. American Water Works Association:

1. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In., for Water Transmission and Distribution.
2. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service.
3. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1,600 mm), for Water Distribution and Transmission.

1.3 COORDINATION

A. Coordinate Work of this Section with equipment installation.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's catalog information on pipe materials and fittings.

C. Shop Drawings: Indicate layout of piping systems, including equipment, critical dimensions, sizes, and materials lists.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

F. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Requirements for submittals.

B. Project Record Documents:
1. Record actual locations of piping, valves and other appurtenances, connections, and invert elevations.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 78 23 – Operation and Maintenance Data: Requirements for maintenance materials.

B. Spare Parts:
1. Furnish one set of manufacturer's recommended spare parts.

C. Tools: Furnish special wrenches and other devices required for Owner to operate and maintain.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for delivery, storage, handling, and protecting products.

B. Deliver materials in manufacturer's packaging according to ASTM D3892.

C. Protect piping and tubing from puncture, abrasion, moisture, and ultraviolet radiation by storing according to manufacturer's recommendations.

1.8 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

B. Temperature: Do not install pipe when temperature is below 40 degrees F or above 90 degrees F if pipe is exposed to direct sunlight.

C. Ultraviolet (UV) Protection: Provide pipe installed above ground or outside with UV protection.

1.9 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 PVC PIPE, TUBE, AND FITTINGS

A. PVC Pipe and Fittings:
1. Pipe: ASTM D1785, Schedule 80; ASTM D2241, SDR-26 for 160-psig pressure rating, calculated according to ASTM D2837; SDR-21 for 200-psig rating, calculated according to ASTM D283; as indicated drawings.
2. Fittings: ASTM D2467, Schedule 80; ASTM D2464, threaded type.
3. Joints: Socket, solvent-welded, ASTM D2855; threaded or flanged if later removal is required.
4. Materials: ASTM D1784, cell classification 12545-C.

B. PVC Pipe and Fittings:
1. Pipe: AWWA C900, Class 165.
2. Fittings: AWWA C111, cast iron.
3. Joints: ASTM D3139, compression gasket ring.
4. Materials: ASTM D1784, minimum cell classification 12545-C.

C. PVC Tube and Fittings:
1. Tube:
a. Clear.
b. Size and Wall Thickness: As indicated on Drawings.
c. Pressure Rating: As indicated on Drawings.
2. Fittings: Compression type; materials suitable for application.
3. Threads: Straight; ASME B1.1.

2.2 CPVC PIPE AND FITTINGS

A. CPVC Pipe and Fittings:

1. Pipe: ASTM F441, Schedule 40.
2. Fittings:
    a. Flanged: ASME B16.1, ASME B16.5, Class 125.
    b. Socket Welded: ASTM F438, Schedule 40.
    c. Threaded: ASTM F437, Schedule 80; ASME B1.20.1.
3. Joints: Socket welded; threaded or flanged if later removal is required.
4. Materials: ASTM D1784, minimum cell classification 23447.

2.3 PE PIPE, TUBE, AND FITTINGS

A. Polyethylene Pipe and Fittings:
1. Pipe: AWWA C901, AWWA C906, DR as indicated on Drawings.
2. Fittings: AWWA C901, AWWA C906, molded or fabricated.
3. Joints: Butt fusion; threaded or flanged if later removal is required.
4. Materials: ASTM D3350, minimum cell classification 324433-C.

B. Polyethylene Tube and Fittings:
1. Tube:
    a. AWWA C901.
    b. Size and Wall Thickness: as indicated on piping Drawings.
    c. Pressure Rating: As indicated on Drawings.
2. Fittings: Compression type; materials suitable for application.
3. Threads: Straight; ASME B1.1.

2.4 CROSSLINKED POLYETHYLENE (PEX) TUBING

A. PEX Pipe and Fittings:
1. Pipe: ASTM F876 SDR9
2. Dimensions: CTS
3. Pressure Rating: 160 psi # 74 deg. F
4. Fittings: Poly Fittings per ASTM F877/F2159
5. Securing System: ASTM F2098 S.S. Clamps for barbed fittings

2.5 FINISHES

A. Coat machined faces of metallic flanges with temporary rust-inhibitive coating.

2.6 ACCESSORIES

A. PVC Piping:
1. Flange Bolting: Stainless steel, ASTM A193 Grade B8 hex head bolts and ASTM A194 Grade 8 hex head nuts.
2. Flange Gaskets: Full faced, ethylene propylene diene monomer (EPDM,), according to ASME B16.21.
3. Solvent Cement: ASTM D2564; primers according to ASTM F656.

B. CPVC Piping:
1. Flange Bolting: Stainless steel, ASTM A193 Grade B8 hex head bolts and ASTM A194 Grade 8 hex head nuts.

2. Flange Gaskets: Full faced, EPDM, according to ASME B16.21.
3. Push-On Joint Seals: EPDM, according to ASTM F477.
4. Solvent Cement: ASTM F493.

C. PE Piping:
1. Insert Fittings: ASTM D2609.
2. Couplings: ASTM F1055.
3. Flange Bolting: Stainless steel, ASTM A193 Grade B8 hex head bolts and ASTM A194 Grade 8 hex head nuts.
4. Flange Gaskets: Full faced, EPDM, according to ASME B16.21.

2.7 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 77 00 - Closeout Procedures: Requirements for installation examination.

B. Verify that field dimensions are as indicated on Shop Drawings.

C. Inspect existing flanges for nonstandard bolt hole configurations or design, and verify that new pipe and flange mate properly.

3.2 PREPARATION

A. Section 01 77 00 - Closeout Procedures: Requirements for installation preparation.

B. Ream pipe and tube ends. Remove burrs.

C. Thoroughly clean pipe and fittings before installation.

D. Surface Preparation:
1. Clean surfaces to remove foreign substances.

3.3 INSTALLATION

A. Run piping straight along alignment indicated on Drawings and Shop Drawings with minimum number of joints.

B. Install piping and components according to ASME B31.3.

C. Fittings:
   1. Clean gasket seats thoroughly, and wipe gaskets clean prior to installation.
   2. Install fittings according to manufacturer's instructions.
   3. Tighten bolts progressively, drawing up bolts on opposite sides until bolts are uniformly tight; use torque wrench to tighten bolts to manufacturer's recommendations.

D. Provide required upstream and downstream clearances from devices as indicated.

E. Install piping with sufficient slopes for venting or drainage of liquids and condensate to low points.

F. Support exposed piping as specified in Section 40 05 29 - Hangers and Supports for Process Piping and Equipment.

G. Provide expansion joints as specified in Section 40 05 13 - Common Work Results for Process Piping and pipe guides as specified in Section 40 05 29 - Hangers and Supports for Process Piping and Equipment to compensate for pipe expansion due to temperature differences.

H. Disinfection: Disinfect potable water piping as specified in Section 33 13 00 - Disinfecting of Water Utility Distribution.

I. Field Cuts: According to pipe manufacturer's recommendations.

J. Joining:
   1. Perform heat joining according to ASTM D2657.
   2. Perform electrofusion joining according to ASTM F 1290.
   3. Primers and Cleaners: ASTM F402.
   4. PVC Solvent-Cemented Joints: ASTM D2855.

K. Insulation: As indicated on Drawings and on Shop Drawings.

L. Underground Piping: As specified in Section 33 11 16 - Site Water Utility Distribution Piping.

3.4 TOLERANCES

A. Section 01 40 00 - Quality Requirements: Requirements for tolerances.

B. Laying Tolerances: As specified in Section 33 11 16 - Site Water Utility Distribution Piping.

3.5 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Inspect for damage to pipe lining or coating, or other defects that may be detrimental as determined by the Engineer. Repair damaged piping, or provide new, undamaged pipe.

C. After installation, inspect for proper supports and interferences.

D. Pressure Testing:

1. According to the following:
    a. Test Pressure: Test at 1½ times the working pressure or 100 psi , whichever is greater.
    b. Conduct hydrostatic test for at least two hours.
    c. Fill section to be tested with water slowly; expel air from piping at high points. Install corporation cocks at high points. Close air vents and corporation cocks after air is expelled. Raise pressure to specified test pressure adjust pressure until pipe has expanded and stabilized at test pressure.
    d. Observe joints, fittings, and valves under test. Remove and renew cracked pipe, joints, fittings, and valves showing visible leakage. Retest.
    e. Correct visible deficiencies and all leaks continue testing at same test pressure for additional two hours to determine leakage rate. Maintain pressure within plus or minus 5 psi of test pressure.

3.6 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements specifies requirements for cleaning.

B. Keep pipe interior clean as installation progresses.

C. Clean pipe interior of soil, grit, shavings, and other debris after pipe installation.

END OF SECTION 40 05 13.73

SECTION 40 05 23 - COMMON WORK RESULTS FOR PROCESS VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Valves.
   2. Valve actuators.

B. Related Requirements:
   1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for placement of concrete as required by this Section.
   2. Section 05 50 00 - Metal Fabrications: Miscellaneous metalwork and fasteners specified by the Section.
   3. Section 09 96 00 - High-Performance Coatings: Fluid-applied coatings for corrosion resistance.
   4. Section 33 11 16 - Site Water Utility Distribution Piping: Valve boxes, covers, extensions, and valve extensions specified in this Section.
   5. Section 40 05 13 - Common Work Results for Process Piping: Connection of valves to process piping as specified in this Section.
   6. Section 40 05 29 - Hangers and Supports for Process Piping: Product and execution requirements for valve supports specified by this Section.
   7. Section 40 05 53 – Identification for Process Piping
   8. Section 46 05 13 - Common Motor Requirements for Water and Wastewater Equipment: Single- and three-phase motor requirements for equipment specified in this Section.

1.2 REFERENCE STANDARDS

A. ASTM International:
   1. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
   2. ASTM B84 - Standard Test Method for Temperature-Resistance Constants of Alloy Wires for Precision Resistors.

B. American Water Works Association:
   1. AWWA C504 - Rubber-Seated Butterfly Valves.
   2. AWWA C541 - Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates.
   3. AWWA C542 - Electric Motor Actuators for Valves and Slide Gates.
   4. AWWA C550 - Protective Interior Coatings for Valves and Hydrants.

C. NSF International:
   1. NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects.
   2. NSF/ANSI Standard 14 - Plastic Piping System Components and Related Materials.

1.3 COORDINATION

A. Coordinate Work of this Section with piping and appurtenances.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit data for actuator, with model number and size indicated.
   2. Submit valve cavitation limits.

C. Shop Drawings:
   1. Provide assembly drawings indicating parts list, materials, sizes, position indicators, limit switches, control system, actuator mounting, wiring diagrams, and control system schematics.

D. Valve-Labeling Schedule: Indicate valve locations and nametag text.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturers' Instructions: Submit installation instructions and special requirements.

G. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Requirements for closeout procedures.

B. Project Record Documents: Record actual locations of valves and actuators.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 78 23 – Operation and Maintenance Data: Requirements for maintenance materials.

B. Tools: Furnish special wrenches and other devices required for Owner to maintain..

1.7 QUALITY ASSURANCE

A. Maintain clearances as indicated on Drawings and Shop Drawings.

1.8 QUALIFICATIONS

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on-Site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemicals, and damage by storing in original packaging.

1.10 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 VALVES

A. Provide valves, operator, actuator, handwheel, chain wheel, extension stem, floor stand, worm and gear operator, operating nut, chain, wrench, and other accessories as required.

B. Valve Ends: Compatible with adjacent piping system.

C. Operation: Open by turning counterclockwise; close by turning clockwise. Cast opening/closing directional arrow on valve or actuator with OPEN and CLOSE cast on valve in appropriate location.

D. Valve Marking and Labeling:
   1. Labeling: As specified in Section 40 05 53 – Identification for Process Piping.
   2. Provide buried valves with valve boxes, covers, and extensions as specified in Section 33 11 16 - Site Water Utility Distribution Piping.

E. Valve Construction:
   1. Bodies: Rated for maximum temperature and pressure to which valve will be subjected; as specified in particular valve Section.
   2. Bonnets: Clamped, screwed, or flanged to body and of same material and pressure rating as body; provide glands, packing nuts, or yokes as specified in valve Sections.
   3. Stems and Stem Guides:
      a. Of materials and with seals as specified in valve Sections.
      b. Bronze Valve Stems: According to ASTM B62.
      c. Space stem guides 10 ft o.c.
      d. Submerged Stem Guides: Type 304 stainless steel.
   4. Nuts and Bolts: According to Section 05 50 00 - Metal Fabrications.

2.2 VALVE ACTUATORS

A. Provide actuators with position indicators for shutoff valves 3 in and larger; according to AWWA C540.

B. Provide chain actuators for shutoff valves mounted 7 ft above operating floor level.

C. Provide gear and power actuators with position indicators.

D. Gear-Assisted Manual Actuators:
   1. Provide totally enclosed gears.
   2. Maximum Operating Force: 60 lbf.
   3. Bearings: Permanently lubricated bronze.

4. Packing: Accessible for adjustment without requiring the removal of actuator from valve.
5. Butterfly Valves: According to AWWA C504.

E. Chain Actuator: Sprocket-rim chain wheels, chain guides, and hot-dip galvanized operating chain extending to 5-1/2 ft above operating floor level. Provide for chain storage where chains may interfere with pedestrian traffic.

F. Valve Actuators in NEC Class I, Group D, Division 1 or 2 Hazardous Locations: UL approved.

G. Pneumatic Actuators: Provide oil lubricators, isolating valves, filter regulators, pressure gages, and condensate drains. Provide local control to override automatic operation.

H. Electric Motor Actuators:
1. Electrical Characteristics: According to Section 26 05 03 - Equipment Wiring Connections;
2. Motors: NEMA MG 1.
3. Gearing: Single or double reduction unit; spur or helical gears and worm gearing; grease or oil lubricated in sealed housing.

2.3 ELECTRIC MOTOR ACTUATORS—OPEN/CLOSE SERVICE (VALVES 6 INCH & SMALLER)

A. Provide motor actuators where indicated on Drawings, for automated system operation via local program logic controller (PLC), or as specified for individual systems.

B. Each motor actuator to consist of motor, gearing, limit switches, lubricants, heating elements, wiring, terminals, and integral reversing controller constructed as a self-contained unit

C. Housing: NEMA 4 with baked-on powder coated epoxy

D. Motors:
1. Thermal overload sensor
2. 50% duty cycle
3. Voltage rating: 120 V, 60 Hz, 1 phase
4. Produce 1.5 times required torque
5. Motor overload protective device

E. Gearing: Epicyclical for smooth operation

F. Lubrication: Gear train and drive components immersed in multipurpose grease suitable for service of 32 degrees to 150 degrees F

G. Actuator Configuration:
1. Two (2) switches on the logic board to configure each function and parameter including:
   a. torque
   b. open/close speed
   c. output contacts
2. Provided with local manual override.

H. Electronic Controls:
1. Remote Modulation: Internal drive

2. to reverse the actuator rotation direction via remote control signals with internal 24 V DC or external 24 V DC/AC up to 120 V DC/AC power supply.
3. Valve Position Control and Indication: 4-20 mA input and output.

I. Heating elements:
1. Provide in motor and geared limit switch compartment
2. Rated 120 V ac
3. Continuously energized

J. Manufacturers:
1. Keystone Model EPI2
2. EL-O-Matic
3. Or approved equal.

2.4 INSULATION

A. As indicated on Drawings and on Shop Drawings.

2.5 SUSTAINABILITY CHARACTERISTICS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design compliance.

B. Material and Resource Characteristics:
1. Recycled Content Materials: Furnish materials with maximum available recycled content .

2.6 MATERIALS

A. Materials in contact with potable water listed as compliant with:
1. NSF Standard 61.
2. NSF Standard 14.

2.7 FINISHES

A. Valve Protective Interior Coating: According to AWWA C550.

B. Exposed Valves: According to Section 09 96 00 – High Performance Coatings.

C. Do not coat flange faces of valves unless otherwise specified.

2.8 ACCESSORIES

A. Handwheel: Provide permanently attached handwheel for emergency manual operation.
1. No rotation during powered operation.
2. Permanently affix directional arrow and cast OPEN and or CLOSE on handwheel to indicate the appropriate direction to turn the handwheel.
3. Maximum Operating Force: 60 lbf.

2.9 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing:
   1. Test valves according to manufacturer's standard testing protocol, including hydrostatic, seal, and performance testing.
   2. Certification of Valves Larger than 12 in: Certified copies of hydrostatic factory tests, indicating compliance with applicable standards.

C. Certificate of Compliance: When fabricator is approved by authorities having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
   1. Specified shop tests are not required for Work performed by approved fabricator.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping system is ready for valve installation.

3.2 INSTALLATION

A. Install valves, actuators, extensions, valve boxes, and accessories according to manufacturer's instructions.

B. Firmly support valves to avoid undue stresses on piping.

C. Coat studs, bolts, and nuts with anti-seizing lubricant.

D. Clean field welds to remove slag and splatter to provide a smooth surface.

E. Install valves with stems upright or horizontal, not inverted.

F. Install brass male adapters each side of valves in copper-piped system. Solder adapters to pipe.

G. Install valves with clearance for installation of insulation and allowing access.

H. Provide access where valves and fittings are not accessible.

I. Comply with Section 40 05 29 - Hangers and Supports for Process Piping and Equipment for pipe hangers and supports.

J. Comply with Division 40 - Process Integration, for piping materials applying to various system types.

K. Install insulation as indicated on Drawings and on Shop Drawings.

L. Valve Applications:
   1. Install shutoff valves at locations as indicated on Drawings, according to this Section.
   2. Install shutoff and isolation valves; isolate equipment, part of systems, or vertical risers, as indicated on Drawings.
   3. Install valves for throttling, bypass, or manual flow control services, as indicated on Drawings.
   4. Install ball and/or gate valves in water systems for shutoff service.
   5. Install ball and/or plug valves in sanitary systems for shutoff service.

3.3 FIELD QUALITY CONTROL

A. Valve Field Testing:
   1. Test for proper alignment.
   2. Where specified by individual specification Section, field test equipment to demonstrate operation without undue noise, vibration, or overheating.

3.4 TRAINING

A. A factory trained representative shall conduct a training session with the operators and other plant personnel to familiarize them with motorized valve actuators, the operational procedures and the maintenance procedures that need to be followed and performed.

END OF SECTION 40 05 23

SECTION 40 05 23.12 - BALL VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rubber-seated ball valves.
   2. Plastic ball valves.

B. Related Requirements:
   1. Section 40 05 23 - Common Work Results for Process Valves: Basic materials and methods related to valves commonly used for process systems.
   2. Section 46 05 53 - Identification for Water and Wastewater Equipment

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
   1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.
   2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard.
   3. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.
   4. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.
   5. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).

B. ASTM International:
   1. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
   2. ASTM D3222 - Standard Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials.
   3. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.

C. American Water Works Association:
   1. AWWA C507 - Ball Valves, 6 In. Through 60 In. (150 mm Through 1,500 mm).

D. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit catalog information, indicating materials of construction and compliance with indicated standards.

C. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

PART 2 PRODUCTS

2.1 RUBBER-SEATED BALL VALVES

A. 4 inches through 48 inches:
   1. AWWA C507, Class 150
   2. Minimum Working Pressure: 75 psig.
   3. Maximum Fluid Temperature: 100 degrees F.
   4. ASTM A536, ductile iron body with rubber seats.
   5. ASTM A536, ductile iron ball with stainless-steel surfacing.
   6. Buna-N bearing seal, O-rings, and packing.
   7. Type 316 stainless-steel shaft and attachment pins.
   8. PTFE-lined bearings with fiberglass backing.
   9. Self-lubricating; self-adjusting shaft seals.
   10. Connecting Hardware: Type 316 stainless steel.
   11. End Connections: ASME B16.1, ASME B16.5, ASME B16.42, flanged.
   12. Operator: Handwheel or Electrically actuated.

B. Smaller than 4 inches:
   1. MSS SP 110.
   2. Minimum Working Pressure: 75 psig at 100degrees F.
   3. Maximum Fluid Temperature: 100 degrees F.
   4. Bronze body.
   5. Stainless-steel ball.
   6. Full port, Buna-N seats.
   7. Blow-out-proof stem.
   8. End Connections: Threaded with union.
   9. Operator: Hand lever or Electrically actuated.
   10. Finishes: As specified in Section 40 05 23 - Common Work Results for Process Valves.

2.2 PLASTIC BALL VALVES

A. Manufacturer List:
   1. Spears, True Union 2000.
   2. Hayward, True Union
   3. Asahi/American Type 21 True Union
   4. Substitutions: Section 01 67 00 - Product Requirements.

B. Description:
   1. Minimum Working Pressure: 225 psig.
   2. Maximum Fluid Temperature: 100 degrees F.
   3. Full-size ports.
   4. End Connections: Union.

C. Operator: Hand lever, or electrically actuated.

D. Materials:
   1. ASTM D1784, PVC, ASTM D1784, CPVC.

2. Seats: PTFE.

2.3 SOURCE QUALITY CONTROL

A. Testing: Test ball valves according to AWWA C507.

PART 3 EXECUTION

3.1 INSTALLATION

A. Support valves in plastic piping to prevent undue stresses on piping.

Tag	Service	Size (in)	Material	

END OF SECTION 40 05 23.12

SECTION 40 05 23.15 - GATE VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient-seated gate valves.
   2. Solid wedge, metal-seated gate valves.
   3. General duty gate valves smaller than 3 inches.

B. Related Requirements:
   1. Section 40 05 23 - Common Work Results for Process Valves: Basic materials and methods related to valves commonly used for process systems.
   2. Section 46 05 53 - Identification for Water and Wastewater Equipment

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
   1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.
   2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard.
   3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.
   4. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).

B. ASTM International:
   1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   2. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
   3. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
   4. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

C. American Water Works Association:
   1. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service.
   2. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends.
   2. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.

1.3 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data:

1. Submit catalog information, indicating materials of construction and compliance with indicated standards.

C. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

PART 2 PRODUCTS

2.1 RESILIENT-SEATED GATE VALVES

A. Description:
   1. AWWA C509.
   2. Minimum Working Pressure 150 psig.
   3. Maximum Fluid Temperature: 125 degrees F.
   4. End Connections: ASME B16.1, ASME B16.5, ASME B16.42, flanged or mechanical joint as shown on Drawings.
   5. Provide gear actuators conforming to AWWA C509 for manual valves.

B. Operation:
   1. Non-rising stem.

C. Materials:
   1. Wedge: Resilient ASTM A126, cast iron, fully encapsulated with Buna-N.
   2. Body and Disc: ASTM A126, cast iron or ASTM A536, ductile iron, Buna-N coated.
   3. Stem, Stem Nuts, Glands, and Bushings: ASTM B584, bronze.
   4. Connecting Hardware: Type 316 stainless steel.

2.2 SOLID WEDGE, METAL-SEATED GATE VALVES

A. Description:
   1. AWWA C500.
   2. Minimum Working Pressure: 150 psig.
   3. Maximum Fluid Temperature 125 degrees F.
   4. Wedge: One piece, solid.
   5. End Connections: ASME B16.1, ASME B16.5, ASME B16.42, flanged or Mechanical joint as shown on Drawings.

B. Operation:
   1. Buried Service: Non-rising stem.
   2. Interior and Exposed Service:
      a. Outside screw and yoke (OS&Y).
      b. Provide NRS valves with position indicators.
   3. Provide gear actuators conforming to AWWA C500 for manual valves.
   4. Valves 18 inches and Larger: Furnish bevel or spur gear operator.

C. Materials: AWWA C500.
   1. Body, Bonnet, Wedge, and Gland: ASTM A536, ductile iron.
   2. Handwheel or Nut]: Ductile iron.
   3. Stem: Stainless steel.

4. Trim: Bronze.
5. Packing: Non-asbestos graphite.
6. Rollers and Tracks: Bronze.
7. Rubber Components: Buna-N.
8. Connecting Hardware: Type 316 stainless steel.

D. Finishes: As specified in Section 40 05 23 - Common Work Results for Process Valves.

2.3 GENERAL-DUTY GATE VALVES - SMALLER THAN 3 INCHES

A. 2 inches and Smaller:
1. MSS SP 80, Class 125.
2. Maximum Fluid Temperature 125 degrees F.
3. Body and Trim: ASTM B62, bronze.
4. Bonnet: Threaded.
5. Operation: Handwheel.
6. Inside screw with back-seating stem.
7. Wedge Disc: Solid; ASTM B62, bronze.
8. End Connections: threaded.

B. 2-1/2 inches to 3 inches:
1. MSS SP 70, Class 125.
2. Maximum Fluid Temperature125 degrees F.
3. Stem: Rising.
4. Body: ASTM A126, cast iron.
5. Trim: Bronze.
6. Bonnet: Bolted bonnet.
7. Handwheel, outside screw and yoke.
8. Wedge Disc: Solid, with bronze seat rings.
9. End Connections: ASME B16.1, ASME B16.5, ASME B16.42, flanged.

2.4 PLASTIC GATE VALVES

A. Description:
1. Size: 1/2 inch and larger.
2. Minimum Working Pressure: 50 psig.
3. Maximum Fluid Temperature: 125 degrees F.
4. End Connections: ASTM B1.20.1, threaded.

B. Operation:
1. Stems: Rising.
2. Operators: Handwheel.

C. Materials:
1. ASTM D1784, PVC, ASTM D1784, CPVC.
2. Wedge Disc: Styrene butadiene rubber].

2.5 SOURCE QUALITY CONTROL

A. Testing: Test gate valves according to AWWA C509.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install according to manufacturer's instructions.

B. Support valves to prevent undue stresses on piping.

END OF SECTION 40 05 23.15

SECTION 40 05 23.24 - CHECK VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Swing check valves, 3 inches and larger.
   2. Swing check valves, resilient-seated.
   3. Double-disc swing check valves.
   4. Check valves for air service.
   5. Tilting disc check valves.
   6. Silent check valves.
   7. Plastic check valves.

B. Related Requirements:
   1. Section 40 05 23 - Common Work Results for Process Valves: Basic materials and methods related to valves commonly used for process systems.
   2. Section 46 05 53 - Identification for Water and Wastewater Equipment

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
   1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.
   2. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.
   3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings.

B. ASTM International:
   1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   2. ASTM A536 - Standard Specification for Ductile Iron Castings.
   3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
   4. ASTM B148 - Standard Specification for Aluminum-Bronze Sand Castings.
   5. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
   6. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications.
   7. ASTM D3222 - Standard Specification for Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials.
   8. ASTM D4101 - Standard Specification for Propylene Injection and Extrusion Materials.

C. American Water Works Association:
   1. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 24-In. (50-mm Through 600-mm) NPS.

D. National Science Foundation:
   1. NSF 61 - Drinking Water System Components - Health Effects.

1.3 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit catalog information, indicating materials of construction and compliance with indicated standards.

C. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

PART 2 PRODUCTS

2.1 SWING-FLEX CHECK VALVE

A. Tag Series:
   1. Description:
      a. Type: Full-flow, with domed access cover and flexible disc.
      b. Standard: AWWA C508.
      c. Service: Corrosive, wastewater slurry
      d. Minimum Working Pressure: 250 psig
      e. Flow Area: 4-inch valve pass 3-inch solids.
      f. Connections: ANSI B16.1, Class 125 flanged
   2. Materials:
      a. Body and Cover: ASTM A536, ductile iron.
      b. Disc: One-piece, Viton, nylon molded w/ steel reinforcement
      c. Connecting Hardware: Type 304 stainless steel.
      d. Installation: Vertical & Horizontal
      e. Accessories: For locations at RAS and WAS Pumps (CV-234 & CV-266), provide with screw-type backflow actuator and mechanical indicator.
   3. Finishes:
      a. Rubber lining
      b. As specified in Section 40 05 23 - Common Work Results for Process Valves.
   4. Manufacturer: Val-matic Swing Flex, or approved equal.

2.2 SWING CHECK VALVES, 3 INCHES AND LARGER

A. Tag Series: **CV-902, 1002**
   1. Description:
      a. AWWA C508.
      b. Type: Swing, resilient-seated, with outside lever and adjustable weight.
      c. Minimum Working Pressure 175 psig .
      d. Maximum Fluid Temperature: 125 degrees F.
      e. Flow Area: equal to connecting nominal pipe diameter.
      f. Mounting: Horizontal or vertical.
      g. End Connections: ASME B16.1, flanged; ASME B16.42, flanged.
      h. Manufacturer/Make: Mueller A-3600, or equal

B. Materials:

1. Body and Cover: ASTM A126, cast iron; ASTM A536, ductile iron.
2. Disc: ASTM A 536, ductile iron; ASTM B62, bronze.
3. Seat: Field-replaceable, Type 304 stainless steel; ASTM B62, bronze.
4. Chamber and Plunger: ASTM B62, bronze.
5. Hinge Pin and Key: Stainless steel.
6. Packing and O-Ring: Buna-N.
7. Rubber Components: Buna-N.
8. Connecting Hardware: Type 304 stainless steel.

C. Finishes: As specified in Section 40 05 23 - Common Work Results for Process Valves.

2.3 SILENT CHECK VALVES, 2 INCHES THROUGH 10 INCHES

A. Tag Series:
   1. Description:
      a. Type: Globe, center guided.
      b. Minimum Working Pressure: 200 psig.
      c. Maximum Fluid Temperature: 125 degrees F.
      d. End Connections: ASME B16.1, flanged; ASME B16.42, flanged.

B. Materials:
   1. Body: ASTM A126, cast iron; ASTM A536, ductile iron.
   2. Trim: Stainless steel.
   3. Spring: Stainless steel.

C. Finishes: As specified in Section 40 05 23 - Common Work Results for Process Valves.

2.4 PLASTIC CHECK VALVES

A. Description:
   1. Type: Y-check, or swing check/ball valve combo
   2. Minimum Working Pressure: 150psig.
   3. Maximum Fluid Temperature: 125 degrees F.
   4. End Connections: Flanged; ASME B120.1, threaded.

B. Materials:
   1. ASTM D1784, PVC; ASTM D1784, CPVC.
   2. Seal: Elastomer.
   3. Hinge Pin: Stainless steel.

C. Finishes: As specified in Section 40 05 23 - Common Work Results for Process Valves.

2.5 SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Testing:
   1. Hydrostatically test check valves at twice rated pressure, in conformance with requirements of AWWA C508.

2. Permitted Leakage at Indicated Working Pressure: None.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install check valves according to AWWA C508 and as recommended by manufacturer.

END OF SECTION 40 05 23.24

SECTION 40 05 23.72 - MISCELLANEOUS PROCESS VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solenoid valves.

B. Related Requirements:
   1. Section 40 05 23 - Common Work Results for Process Valves: Basic materials and methods related to valves commonly used for process systems.

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
   1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.
   2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard.
   3. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.
   4. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.
   5. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).

B. ASTM International:
   1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
   2. ASTM A536 - Standard Specification for Ductile Iron Castings.
   3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
   4. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

1.3 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data:
   1. Submit catalog information, indicating materials of construction and compliance with indicated standards.

C. Source Quality-Control Submittals: Indicate results of factory tests and inspections.

PART 2 PRODUCTS

2.1 SOLENOID VALVES

A. Products and Manufacturers: Tag Series **SV-932, 1032, 955, 1055**
   1. Type: Electrically actuated CPVC ball valve.

2. Flow Control: Automatic, 4-20mA
3. Actuator Flow Control Type: Linear, -CLF
4. Headloss: 1 psi
5. Minimum Working Pressure: 200 psig.
6. Maximum Fluid Temperature: 125 degrees F.
7. Operation: Fail close, energize to open.
8. End Connections: Threaded couplers w/ FPT ends.
9. Manufacture: Plast-O-Matic CAFÉ

2.5 SOURCE QUALITY CONTROL

A. Testing Pressure-Reducing and Pressure-Sustaining Valves:
   1. Leakage Testing:
      a. Test each assembled valve hydrostatically at 1-1/2 times rated working pressure for minimum five minutes.
      b. Test each valve for leakage at rated working pressure against closed valve.
      c. Permitted Leakage: None.
   2. Functional Testing:
      a. Test each valve to verify specified performance.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install protective strainers upstream of solenoid valves, pressure-reducing valves, and pressure-sustaining valves.

END OF SECTION 40 05 23.72

SECTION 40 05 29 - HANGERS AND SUPPORTS FOR PROCESS PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Pipe hangers and supports.
2. Hanger rods.
3. Structural attachments.
4. Pipe guides.
5. Formed steel channel.

B. Related Requirements:
1. Section 03 10 00 - Concrete Forming and Accessories: Execution requirements for placement of inserts and sleeves in concrete forms specified by this Section.
2. Section 03 30 00 - Cast-in-Place Concrete: Execution requirements for placement of concrete housekeeping pads specified by this Section.
3. Section 22 07 00 - Plumbing Insulation: Process piping insulation requirements.
4. Section 09 90 00 - Painting and Coating: Product and execution requirements for painting specified by this Section.
5. Section 40 05 13 - Common Work Results for Process Piping: Pipe penetrations, including sleeves, flashings, and sealing.
6. Section 40 05 13.13 - Steel Process Piping: Execution requirements for placement of hangers and supports specified by this Section.
7. Section 40 05 13.19 - Stainless Steel Process Piping: Execution requirements for placement of hangers and supports specified by this Section.
8. Section 40 05 13.53 - Ductile, Malleable, and Cast Iron Alloys Process Piping: Execution requirements for placement of hangers and supports specified by this Section.
9. Section 40 05 13.73 - Plastic Process Piping: Execution requirements for placement of hangers and supports specified by this Section.
10. Section 40 05 23 - Common Work Results for Process Valves: Common product requirements for valves for placement by this Section.

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
1. ASME B31.1 - Power Piping.
2. ASME B31.9 - Building Services Piping.

B. ASTM International:
1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A47 - Standard Specification for Ferritic Malleable Iron Castings.
3. ASTM A576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
4. ASTM A181 - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping.

C. American Welding Society:

1. AWS D1.1 - Structural Welding Code Steel - Reference Manual.

D. Manufacturers Standardization Society of the Valve and Fittings Industry:
   1. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacturer, Selection, Application, and Installation.

1.3 COORDINATION

A. Coordinate Work of this Section with piping and equipment connections specified in other Sections and indicated on Drawings.

1.4 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's catalog data including load capacity.

C. Shop Drawings: Indicate system layout with location - including critical dimensions, sizes, and pipe hanger and support locations - and detail of trapeze hangers, anchors, and guides.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturers' Instructions: Submit special procedures and assembly of components.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Inspection: Accept materials on-Site in original factory packaging, labeled with manufacturer's identification.

C. Protect products from weather and construction traffic, dirt, water, chemical, and damage by storing in original packaging.

1.6 AMBIENT CONDITIONS

A. Section 01 50 00 - Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.

1.7 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Unless otherwise described in plan, all pipe supports and hangers and associated hardware shall be stainless steel construction.

B. Manufacturer List:
   1. Anvil International Inc.
   2. National Pipe Hanger Corporation
   3. Empire Industries, Inc.
   4. PHD Manufacturing
   5. Substitutions: Section 01 67 00 - Product Requirements.

C. Description:
   1. Conform to ASME B31.9; MSS SP58.
   2. Provide means of vertical adjustment after erection.
   3. Pipe Sizes 1/2 to 1-1/2 in: AISI 307/316, stainless steel, adjustable swivel, split ring.
   4. Pipe Sizes 2 in and Larger: AISI 307/316, stainless steel, adjustable, clevis.
   5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   6. Wall Support for Pipe Sizes 3 in and Smaller: Cast iron J-hook.
   7. Wall Support for Pipe Sizes 4 in and Larger: Welded steel bracket.
   8. Vertical Support: Riser clamp.
   9. Floor Supports: Galvanized steel adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

D. Performance and Design Criteria:
   1. Pipe Hangers:
      a. Allow for expansion and contraction of piping while eliminating undue stress on piping appurtenances and equipment.
      b. Provide linkage to permit lateral or axial movement where anticipated.
      c. Where horizontal pipe movement is greater than 1/2 in, or where hanger rod deflection from the vertical is greater than 4 degrees from cold to hot position of pipe, hanger rod and structural attachment shall be offset to maintain rod vertical in hot position.
   2. Heat Transmission: Design supports, hangers, anchors, and guides to prevent excessive heat from being transmitted to building structure, equipment, or piping appurtenances.
   3. Riser Supports: Support risers on each floor with riser clamps and lugs, independent of connected horizontal piping.
   4. Point Loads:
      a. Support plastic piping containing meters, valves, appurtenances, and other point loads on both sides.
      b. Avoid point loads on plastic piping by providing extra wide pipe saddles or galvanized steel shields.

2.2 HANGER RODS

A. Hanger Rods:
   1. AISI 307/316, stainless steel.
   2. All-thread.

3. Diameter: ASME B31.1.

2.3 STRUCTURAL ATTACHMENTS

A. Manufacturer List:
   1. Anvil International Inc.
   2. National Pipe Hanger Corporation
   3. Empire Industries, Inc.
   4. Substitutions: Section 01 67 00 - Product Requirements.

B. Concrete Inserts
   1. Description:
      a. Stainless steel case with steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.
      b. Size inserts to suit threaded hanger rods.

C. Mounting Brackets: ASTM A36, welded steel.

D. Beam Clamps:
   1. AISI 307/316, stainless steel; MSS SP-58.
   2. Clamp Size: Based on load to be supported and load configuration.
   3. Anchoring: Locknuts and cup-point set screws.
   4. Reversible top or bottom flange.

E. Riser Clamps:
   1. AISI 307/316, stainless steel.
   2. Support of Copper Tubing: Provide copper-plated clamps.

F. Offset Clamps:
   1. Double leg, two-piece.

2.4 PIPE GUIDES

A. Intermediate Guides:
   1. Pipes 6 in and Smaller: Pipe clamp with oversize pipe sleeve.
   2. Pipes 8 in and Larger: U-bolts with double nuts.

B. Alignment Guides:
   1. Pipes 8 in and Smaller stainless steel Sleeve type.
   2. Pipes 10 in and Larger: Stainless steel Roller type.

2.5 FORMED STEEL CHANNEL

A. Description:
   1. Stainless steel 12-gage-thick steel.
   2. Include holes 1-1/2 in o.c.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify field dimensions as indicated on Shop Drawings.

3.2 INSTALLATION

A. Do not drill or cut structural members.

B. Contractor shall install pipe hangers and supports in accordance with the drawings and this specification. The drawings may not show all necessary supports and hangers and Contractor shall furnish and install additional hangers in accordance with part 3.3 – "Schedules", of this specification. Cost to furnish and install additional hangers and supports beyond that described in the drawings shall be borne by Contractor.

C. Inserts:
1. Install inserts for placement in concrete forms.
2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 in and larger.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

D. Pipe Hangers and Supports:
1. Install according to: ASME 31.9; MSS SP 58.
2. Support horizontal piping as indicated on Drawings and as indicated on Shop Drawings.
3. Install hangers with minimum 1/2 in space between finished covering and adjacent Work.
4. Place hangers within 12 in of each horizontal elbow.
5. Use hangers with 1-1/2 in minimum vertical adjustment.
6. Support horizontal cast iron pipe adjacent to each hub, with 5 ft maximum spacing between hangers.
7. Support vertical piping at every floor. Support vertical cast or ductile iron pipe at each floor at hub.
8. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
9. Support riser piping independently of connected horizontal piping.
10. Provide copper-plated hangers and supports for copper piping.
11. Design hangers for pipe movement without disengagement of supported pipe.
12. Support piping independently so that equipment is not stressed by piping weight or expansion in piping system.
13. Provide welded steel brackets where piping is to be run adjacent to building walls or columns.
14. Use beam clamps where piping is to be suspended from building steel.
15. Insulated Piping: Provide two bolted clamps designed to accommodate insulated piping.
16. Use offset clamps where pipes are indicated as offset from wall surfaces.

E. Insulation:
   1. Provide clearance in hangers and from structure and other equipment for installation of insulation.

F. Equipment Bases and Supports:
   1. Provide housekeeping pads of concrete, minimum 3-1/2 in thick and extending 6 in beyond supported equipment. Comply with Section 03 30 00 - Cast-in-Place Concrete.
   2. Using templates furnished with equipment, install anchor bolts and accessories for mounting and anchoring equipment.
   3. Construct supports of steel members; formed steel channel; steel pipe and fittings. Brace and fasten with flanges bolted to structure.
   4. Provide rigid anchors for pipes after vibration isolation components are installed. Comply with Section 40 05 13 - Common Work Results for Process Piping.

G. Prime Coat:
   1. Prime coat exposed steel alloy (non-stainless) hangers and supports.
   2. Conform to Section 09 96 00 – High Performance Coatings.

3.3 SCHEDULES

PIPE HANGER SPACING		
Pipe Material: Steel, Cast Iron or Ductile Iron	Maximum Hanger Spacing Feet	Hanger Rod Diameter Inches
Pipe Size (inches): 1/2 to 1-1/4	5	3/8
Pipe Size (inches): 1-1/2 to 2	8	3/8
Pipe Size (inches): 2-1/2 to 3	10	1/2 – 5/8
Pipe Size (inches): 4 to 6	10	5/8 – 3/4
Pipe Size (inches): 8 to 12	14	7/8 - 1
Pipe Size (inches): 14 to 18	15	1
Pipe Size (inches): 20 to 24	15	1-1/8 – 1-1/4
Pipe Material: PVC and FRP		
Pipe Size (inches): 1/2 to 1	4	3/8
Pipe Size (inches): 1-1/4 to 2	5	3/8
Pipe Size (inches): 3 to 6	6	5/8 – 3/4
Pipe Size (inches): 8 to 12	8	7/8 - 1
Pipe Material: Copper and Stainless Steel		
Pipe Size (inches): 1 and smaller	5	3/8
Pipe Size (inches): 1-1/4 and larger	2 feet less than maximum for steel pipe of same size	Same as for Steel pipe

END OF SECTION 40 05 29

SECTION 40 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PROCESS PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Spring hangers.
   2. Restrained, closed-spring isolators.
   3. Seismic snubbers.

B. Related Requirements:
   1. Section 40 05 13 - Common Work Results for Process Piping: Basic materials and methods for process piping systems.
   2. Section 40 05 23 - Common Work Results for Process Valves: Basic materials and methods for valves.
   3. Section 40 05 29 - Hangers and Supports for Process Piping and Equipment: Product requirements for pipe hangers and supports.

1.2 COORDINATION

A. Coordinate Work of this Section with process piping requirements.

1.3 SUBMITTALS

A. Section 01 3323 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit schedule of vibration isolator type with location and load on each. Submit catalog information indicating materials and dimensional data.

C. Manufacturer's Installation Instructions: Submit special procedures and setting dimensions.

D. Manufacturer's Certificate: Certify that **isolators** meet or exceed **specified requirements**.

E. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

F. Manufacturer Reports: Indicate sound isolation installation is complete and according to instructions.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of hangers, including attachment points.

1.5 EXISTING CONDITIONS

A. Field Measurements: Verify field measurements prior to fabrication. Indicate field measurements on Shop Drawings.

PART 2 PRODUCTS

2.1 SPRING HANGERS

A. Description:
   1. Exterior and Humid Areas: Furnish hot-dip-galvanized housings and neoprene-coated springs.
   2. Code: Color-code springs for load-carrying capacity.

B. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 30 and 60 percent of maximum deflection.

C. Housings: Incorporate **neoprene isolation pad meeting requirements for neoprene pad isolators**.

D. Deflection: Maintain integrity with 20-degree hanger-rod misalignment.

2.2 RESTRAINED, CLOSED-SPRING ISOLATORS

A. Description:
   1. Exterior and Humid Areas: Furnish hot-dip-galvanized housings and neoprene-coated springs.
   2. Code: Color-code springs for load-carrying capacity.
   3. Type: Closed-spring mount with top and bottom housing separated with neoprene rubber stabilizers.

B. Springs:
   1. Minimum Horizontal Stiffness: 75 percent of vertical stiffness.
   2. Working Deflection: Between 30 and 60 percent of maximum deflection.

C. Housings:
   1. Neoprene Isolation Pad:
      a. Rubber or neoprene waffle pads.
      b. Hardness: 30 durometer.
      c. Thickness: Minimum 1/2 inch.
      d. Maximum Loading: 40 psi.
      e. Height of Ribs: Not to exceed 70 percent of width.
      f. Configuration: **Equipment manufactures recommendation**.
   2. Neoprene Side Stabilizers: Minimum 0.25-inch clearance and limit stops.

2.3 SEISMIC SNUBBERS

A. Description:
   1. Type: Nondirectional and double-acting unit consisting of interlocking steel members restrained by neoprene elements.
   2. Neoprene Elements: Replaceable, minimum 3/4-inch thick.
   3. Capacity: Four times load assigned to mount groupings at 0.4-inch deflection.
   4. Attachment Points and Fasteners: Capable of withstanding three times rated load capacity of seismic snubber.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment and piping is installed before Work of this Section is started.

3.2 INSTALLATION

A. Install spring hangers without binding.

B. Seismic Snubbers:
   1. Provide resiliently mounted piping with seismic snubbers.
   2. Provide clearance between 0.15 inch and 0.25 inch.

C. Horizontal Pipe Isolation:
   1. Provide restrained, closed-spring isolators for mounting of floor-supported piping.

D. Riser Isolation:
   1. Support risers with restrained, closed-spring isolators.

E. Support piping connections to isolated equipment resiliently **to nearest flexible pipe connector, as follows:**
   1. Up to 4-inch Diameter: First three points of support.
   2. 5- to 8-inch Diameter: First four points of support.
   3. 10-inch Diameter and Over: First six points of support.
   4. Select three hangers closest to vibration source for minimum 1-inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1-inch static deflection or 50 percent of static deflection of isolated equipment.

3.3 FIELD QUALITY CONTROL

A. Inspect isolated equipment after installation and submit report, including static deflections.

3.4 CLEANING

A. Remove foreign objects that might bridge vibration isolators.

3.5 PIPE ISOLATION SCHEDULE

PIPE SIZE INCH	**ISOLATED DISTANCE FROM EQUIPMENT**
1	120 diameters
2	90 diameters
3	80 diameters
4	75 diameters
6	60 diameters
8	60 diameters
10	54 diameters

END OF SECTION 40 05 48

SECTION 40 05 53 - IDENTIFICATION FOR PROCESS PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Nameplates.
   2. Tags.
   3. Stencils.
   4. Pipe markers.
   5. Ceiling tacks.
   6. Labels.
   7. Lockout devices.

B. Related Requirements:
   1. Section 09 96 00 – High Performance Coatings: Execution requirements for painting specified by this section.
   2. Section 40 05 13 - Common Work Results for Process Piping: Basic materials and methods for process piping systems.
   3. Section 40 05 23 - Common Work Results for Process Valves: Basic materials and methods or valves.

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
   1. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturer's catalog literature for each product required.

C. Shop Drawings: Submit list of wording, symbols, letter size, and color-coding for mechanical identification and valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements

1.4 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Requirements for closeout procedures.

B. Project Record Documents: Record actual locations of tagged valves; include valve tag numbers.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 78 23 - Closeout and Operation & Maintenance Requirements: Requirements for maintenance materials.

B. Tools: Furnish special crimpers and other devices required for Owner to reinstall tags.

1.6 QUALITY ASSURANCE

A. Conform to ASME A13.1 and Schedule for color scheme for identification of piping systems and accessories.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light, contrasting background color.

2.2 TAGS

A. Plastic Tags:
   1. Description:
      a. Laminated three-layer plastic with engraved black letters on light, contrasting background color.
      b. Minimum Tag Size and Configuration: 1-1/2 inches; square.

B. Metal Tags:
   1. Description:
      a. Aluminum or Stainless Steel construction; stamped letters.
      b. Minimum Tag Size and Configuration: 1-1/2 inches; square with finished edges.

C. Information Tags:
   1. Description:
      a. Clear plastic with printed DANGER, CAUTION, or WARNING and message.
      b. Minimum Tag Size: 3-1/4 by 5-5/8 inch.
      c. Furnish grommet and self-locking nylon ties.
   2. Tag Chart: Typewritten, letter-size list of applied tags and location, plastic laminated.

2.3 STENCILS

A. Stencils: With clean cut symbols and letters of following size:
   1. Up to 1-1/4 inches Outside Diameter of Insulation or Pipe: 1/2 inch high letters.
   2. 1-1/2 to 2 inches Outside Diameter of Insulation or Pipe: 3/4 inch high letters.
   3. 2-1/2 to 6 inches Outside Diameter of Insulation or Pipe: 1-1/4 inch high letters.
   4. Over 6 inches Outside Diameter of Insulation or Pipe: 2-1/2 inch high letters.

B. Stencil Paint: As specified in Section 09 96 00 - Painting and Coating; semigloss enamel.

C. Color-Coding and Lettering Size: Conform to Schedule and ASME A13.1.

2.4 PIPE MARKERS

A. Color-Coding and Lettering Size: Conform to ASME A13.1.

B. Plastic Pipe Markers:
   1. Description:
      a. Factory-fabricated, flexible, semirigid plastic.
      b. Preformed to fit around pipe or pipe covering.
      c. Larger sizes may have maximum sheet size with spring fastener.

C. Plastic Tape Pipe Markers:
   1. Description: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Plastic Underground Pipe Markers:
   1. Description:
      a. Brightly colored, continuously printed plastic ribbon tape.
      b. Minimum 6 inches wide by 4 mil thick.
      c. Manufactured for direct burial service.

2.5 CEILING TACKS

A. Description:
   1. Steel construction.
   2. Head: 3/4-inch diameter; color coded.

B. Color-Coding and Lettering Size: Conform to ASME A13.1.

2.6 LABELS

A. Description:
   1. Polyester construction.
   2. Minimum Size: 1.9 by 0.75 inches.
   3. Adhesive backed, with printed identification.

2.7 LOCKOUT DEVICES

A. Lockout Hasps:
   1. Description:
      a. Reinforced nylon construction.
      b. Furnish hasp with erasable label surface.
      c. Minimum Size: 7-1/4 by 3 inches.

B. Valve Lockout Devices:
   1. Description:
      a. Plastic construction.
      b. Furnish device preventing access to valve operator and accepting lock shackle.

PART 3 EXECUTION

3.1 PREPARATION

A. Section 01 77 00 - Closeout Procedures: Requirements for installation preparation.

B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Prepare surfaces as specified in Section 09 96 00 - High Performance Coatings.

3.2 INSTALLATION

A. Apply stencil painting as specified in Section 09 96 00 – High Performance Coatings.

B. Install identifying devices after completion of coverings and painting. Tag names and numbering designations shall closely follow PID and process drawings. Coordinate installation of identifying devises with Engineer.

C. Install plastic nameplates with corrosion-resistant mechanical fasteners or adhesive.

D. Labels:
   1. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer.
   2. For unfinished covering, apply paint primer before applying labels.

E. Tags:
   1. Install tags using corrosion-resistant chain.
   2. Number tags consecutively by location.

F. Install underground plastic pipe markers 24 inches below finished grade, directly above buried pipe.

G. Identify valves in main and branch piping with tags.

H. Piping:
   1. Paint exposed piping, fittings and valves color according to schedule.
   2. Identify exposed piping, with stenciled painting.
   3. Identify service, flow direction, and pressure.
   4. Install in clear view and align with axis of piping.
   5. Locate identification not to exceed 20 feet on straight runs, including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure, and at each obstruction.

I. Ceiling Tacks:
   1. Provide ceiling tacks to locate valves above T-bar-type panel ceilings.
   2. Locate in corner of ceiling panel closest to equipment.

3.3 SCHEDULED COLOR CODING

A. All 12 inch pipe and smaller

B. Bands where scheduled: 6 inch wide, at 5 foot intervals

C. Provide only bands of color on un-insulated stainless steel and PVC, elsewhere natural finish. Provide PVC pipe in color listed on schedule

3.4 PIPING NOT SCHEDULED

A. Paint to match wall or ceiling, unless otherwise directed by Engineer

B. Appropriately identify and place flow arrows

3.5 SCHEDULE

A. Paint and letter colors

Letters (Pipe Content)	**Color of Pipe**	**Color of Letters**
Potable water (hot or cold)	Blue	White
Phosphate	Green	White
Chlorine Solution	Yellow	Black
Drain	Dark gray	White
Sample	Light gray with green bands	Black

B. Paint electrical conduit aluminum or to match adjacent ceiling or wall surfaces as directed by the Engineer

C. Paint vent lines to match surfaces they adjoin

D. Specialty paint for the following items:

Item	**Color**
Valve hand wheels and levers	Red
Hoist hooks and blocks	Yellow and Black stripes

END OF SECTION 40 05 53

SECTION 40 23 19 - PROCESS PLANT WATER PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipes and tubes for conveying potable process water.
   2. Valves for conveying potable process water.

B. Related Requirements:

   1. Section 05 50 00 - Metal Fabrications: Miscellaneous metalwork and fasteners as required by this Section.
   2. Section 09 96 00 – High Performance Coatings: Product and execution requirements for painting specified by this Section.
   3. Section 40 05 13 - Common Work Results for Process Piping: Piping components, appurtenances, and identification requirements common to process piping systems.
   4. Section 40 05 13.13 - Steel Process Piping.
   5. Section 40 05 13.19 – Stainless Steel Process Piping.
   6. Section 40 05 13.53 - Ductile, Malleable, and Cast Iron Alloys Process Piping.
   7. Section 40 05 13.73 - Plastic Process Piping: Pipe, tube, and fitting materials as required for piping system.
   8. Section 40 05 23 - Common Work Results for Process Valves: Execution requirements for valves specified by this Section.
   9. Section 40 05 23.12 - Ball Valves: Execution requirements for ball valves as required by this Section.
   10. Section 40 05 23.15 - Gate Valves: Execution requirements for gate valves as required by this Section.
   11. Section 40 05 23.18 - Butterfly Valves: Execution requirements for butterfly valves as required by this Section.
   12. Section 40 05 23.24 - Check Valves: Execution requirements for check valves as required by this Section.

1.2 REFERENCE STANDARDS

A. American Society of Mechanical Engineers:
   1. ASME B31.3 - Process Piping Design.

B. ASTM International:
   1. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes.
   2. ASTM B75 - Standard Specification for Seamless Copper Tube.

C. American Water Works Association:
   1. AWWA C950 - Fiberglass Pressure Pipe.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 77 23- Closeout and Operation & Maintenance Requirements: Requirements for maintenance materials.

B. Tools: Furnish special wrenches and other devices required for Owner to maintain completed installation.

PART 2 PRODUCTS

2.1 PIPES AND TUBES FOR CONVEYING POTABLE PROCESS WATER

A. Furnish pipes and tubes, fittings, appurtenances, and accessories as specified in Section 40 05 13 - Common Work Results for Process Piping, as indicated on drawings, and as specified by pipe material in Division 40 - Process Integration.

B. Piping Material:
   1. Steel, according to Section 40 05 13.13 - Steel Process Piping; Ductile iron,
   2. Stainless Steel, according to Section 40 05 13.19 – Stainless Steel Process Piping
   3. Ductile Iron, according to Section 40 05 13.53 – Ductile Iron Process Piping;
   4. PVC, according to Section 40 05 13.73 - Plastic Process Piping;
   5. CPVC, according to Section 40 05 13.73 - Plastic Process Piping;
   6. Polyethylene, according to Section 40 05 13.73 - Plastic Process Piping;
   7. Fiberglass, conforming to AWWA C950;
   8. Copper, conforming to ASTM B42 and ASTM B75.

2.2 VALVES FOR CONVEYING POTABLE PROCESS WATER

A. Furnish valves, appurtenances, and accessories as specified in Section 40 05 23 - Common Work Results for Process Valves, as indicated Drawings, and as specified by valve type in Division 40 - Process Integration.
   1. Furnish shutoff and drain valves at locations as indicated on Drawings, according to this Section.
   2. Install shutoff and isolation valves; isolate equipment, part of systems, or vertical risers as indicated on Drawings.
   3. Install valves for throttling, bypass, or manual flow-control services as indicated on Drawings.
   4. Install ball and gate valves in process potable water systems for shutoff service.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify conditions as specified in Section 40 05 13 - Common Work Results for Process Piping and Section 40 05 23 - Common Work Results for Process Valves.

3.2 PREPARATION

A. Comply with requirements as specified in Section 40 05 13 - Common Work Results for Process Piping.

B. Protect equipment from damage and intrusion of water and other materials.

C. Repair damaged coatings with material equal to the original coating as specified in Section 09 96 00 – High Performance Coatings.

3.3 INSTALLATION

A. Install piping and appurtenances as indicated on Drawings and Shop Drawings using minimum number of joints and according to manufacturer's instructions and ASME B31.3.

B. In locations where pipe expansion joints are indicated, install pipe alignment guides adjacent to and within four pipe diameters of joint.

C. Field Fabrication: Fabricate fittings according to manufacturer's instructions.

D. Provide thrust restraints as required.

E. Provide flexible couplings and expansion joints at connections to equipment and where indicated on Drawings and Shop Drawings.

F. Install couplings, service saddles, and anchors according to manufacturer's instructions.

G. Provide upstream and downstream clearances according to component manufacturer's recommendations.

H. Local Indicators:
   1. Install direct-reading indicator devices such as thermometers and pressure gages, to be read from floor level and accessible for maintenance and service.
   2. Install according to manufacturer's instructions.

I. Orientate valves to permit operation and maintenance access to the valve operator and to avoid interferences with other equipment.

3.4 ADJUSTING

A. Field calibrate local indicators at time of piping installation.

END OF SECTION 40 23 19

SECTION 43 21 13 - CENTRIFUGAL LIQUID PUMPS

PART 1 GENERAL

1 .1 SUMMARY:

A. Section Includes:
1. Supply water booster pumps for chlorine disinfection and orthophosphate chemical feed systems for treatment of Well #9 raw water supply. Pumps (2 ea.) are vertical, multistage centrifugal pumps with integrated variable frequency drive (VFD)/frequency converter.
2. Equipment to include electric motor, pump, pump base, anchor bolts, flange connection, VFD, pressure sensors and all other necessary appurtenances.
3. Pressure Sensors: Per Section 25 30 00, furnished by pump manufacturer

B. Related Requirements:
1. Section 03 30 00 – Cast-In-Place Concrete
2. Section 03 60 00 – Grouting
3. Section 05 05 10 – Anchor Bolts & Expansion Anchors
4. Division 22 – Plumbing
5. Section 25 30 00 – Instrumentation and Control for Process Systems
6. Section 25 51 00 – Integrated Automation Control Sequences for Facility Equipment
7. Division 26 – Electrical
8. Section 33 11 13.13 – Ductile Iron Pipe
9. Division 40 – Process Integration
10. Section 46 05 13 – Identification for Water and Wastewater Equipment

1 .2 QUALITY ASSURANCE

A. Suppliers Qualifications
1. All equipment supplied by a single manufacturer
2. Equipment to be the standard product of the manufacturer modified with special features or accessories or special materials as necessary to conform to the requirements of the specifications
3. Equipment of similar design shall have been supplied by manufacturer for at least five years

1 .3 SUBMITTALS

A. Submit shop drawings under provisions of Section 01 33 23 – Submittal Procedures: Requirements for Submittals

B. Shop drawings are to include:
1. Sufficient data to verify compliance with the specifications and to illustrate construction and assembly of the products
2. Assembly drawings of the completely assembled pumping unit showing configuration of motor, drives and pump with all accessories, dimensions and weights. Indicate the specific equipment identification numbers on each pumping unit drawing
3. Clearances required for maintenance

4. Detailed specifications and data describing materials, parts and accessories used that together make up the complete pumping unit
5. Electrical wiring diagrams

C. Submit Product Data under provisions of Section 01 33 23: Provide manufacturer's literature including general assembly, accessories, performance characteristics, coatings, power requirements, wiring diagrams, service connections, and additional information necessary to determine compliance with these specifications
1. Pump Data
   a. Manufacturer, pump type and model
   b. Materials of construction
   c. Performance curves at maximum rated and minimum operating conditions that indicate pump speed, pressure developed, horsepower requirements and capacity
   d. Bearing type and bearing life
   e. Type and construction of seal
   f. Certification of satisfactory factory testing of each unit as specified in Section 01400
   g. Calculations of critical speeds and mass elastic system analysis for pumps as specified.
   h. Certified shaft deflection calculation.
2. Motor Data:
   a. Manufacturer
   b. Type and model
   c. Nameplate horsepower
   d. Service factor
   e. Full-load current
   f. Efficiency
   g. Temperature rating of insulation
   h. Thermal over-load
   i. Materials of construction
   j. Bearing type and bearing life
3. Manufacturer's Installation Instructions: Provide connection requirements and start-up instructions
4. Operations and Maintenance information
5. Manufacturer's Start-up Report: Indicate personnel present and actual testing and start-up procedures that were performed by manufacturer's representative
6. Warranty

1 .4 SYSTEM CONDITIONS

A. Project location: Jackson, Wyoming, 6,150-ft elevation

B. Pumped liquid: Potable Water

C. General:
1. Stable and free of cavitation and noise throughout the specified operating head range
2. Minimum hydrostatic test pressure: 1.5 x shutoff head plus suction pressure
3. Variable speed operation

D. Environmental Conditions

1. Indoor areas subject to hose down during maintenance
2. Minimum Room temperature, degrees F: 40

1 .5 WARRANTY

A. Section 01700 - OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01 78 23

1 .7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01 67 00

B. Accept pump components on site in factory packing. Inspect for damage. Comply with manufacturer's installation instructions

1 .8 MAINTENANCE MATERIALS

A. Provide the following spare parts under provisions of Section 01 67 00:
1. 2 sets of all gaskets for each pump
2. 1 set of pump bearings for each pump
3. 1 set of wearing rings for each pump
4. 1 mechanical seal per pump
5. 1 shaft sleeve per pump
6. 1 impeller

B. Provide a 1-year supply of all greases and lubricants for each pumping unit

PART 2 PRODUCTS

2 .1 MANUFACTURERS

A. Grundfos,

B. or approve equal.

2 .2 BOOSTER PUMPS FOR CHEMICAL SYSTEMS

A. Booster Pump to feed Orthophosphate System: Tag Series **P-933**
1. Vertical turbine, multi-stage centrifugal pump with integrated frequency converter, Grundfos CRE 1-6, or approved equal.
2. Pump:
   a. Number of Units: 1
   b. Orientation: Vertical close-coupled
   c. Inlet Pressure: 68 to 85 psi
   d. Outlet Pressure: 125 psi
   e. Operating Total Dynamic Head (TDH): 90-ft (min) to 130-ft (max.)
   f. Capacity at rated head: 3 to 6 gpm
   g. Stages: 6
   h. Pump operating speed: 360 to 3600 rpm

i. Connections: 1” NPT

3. Motor:
   a. Manufacture: Grundfos MLE
   b. Electrical: 3/4 HP, 200 to 240V, 2.9 - 3.45A, 60 Hz
   c. Built-in motor protection
   d. Enclosure Class: IP55
   e. Motor Efficiency at Full Load: IE5, 85+%
   f. Insulation Class: F
4. Controls:
   a. Digital Display:
   b. Inputs: Analog, 4-20mA (3 ea.) & Digital (2 ea.)
   c. Outputs: Analog, 4-20mA (1 ea.)
   d. Relay Outputs: 2 ea.
   e. Interface: CIM Field Bus Modules
   f. Dry running protection sensors
   g. Ethernet Compatibility:
      1) Modbus TCP
      2) PROFINET IO
      3) BACnet/IP
   h. Pressure Control (**PT-933**): Provide pump with a built-in, factory fitted, pressure controller and sensor enabling control of the outlet pressure via. automatic variable pump speed control.
      1) Manufacturer: Grundfos MBS3000

B. Booster Pump to feed Chlorine Gas Disinfection System: Tag Series **P-953**
1. Vertical turbine, multi-stage centrifugal pump with integrated frequency converter, Grundfos CRE 1-13, or approved equal.
2. Pump:
   a. Number of Units: 1
   b. Orientation: Vertical Close-coupled
   c. Inlet Pressure: 68 to 85 psi
   d. Outlet Pressure: 180 psi
   e. Operating Total Dynamic Head (TDH): 215-ft (min) to 255-ft (max.)
   f. Capacity at rated head: 5 to 7 gpm
   g. Stages: 13
   h. Pump operating speed: 360 to 3600 rpm
   i. Connections: 1” NPT
3. Motor:
   a. Manufacture: Grundfos MLE
   b. Electrical: 1.5 HP, 200 to 240V, 5.6 – 6.7A, 60 Hz
   c. Built-in motor protection
   d. Enclosure Class: IP55
   e. Motor Efficiency at Full Load: IE5, 85+%
   f. Insulation Class: F
4. Controls:
   a. Digital Display:
   b. Inputs: Analog, 4-20mA (3 ea.) & Digital (2 ea.)
   c. Outputs: Analog, 4-20mA (1 ea.)
   d. Relay Outputs: 2 ea.
   e. Interface: CIM Field Bus Modules

f. Dry running protection sensors
g. Ethernet Compatibility:
    1) Modbus TCP
    2) PROFINET IO
    3) BACnet/IP
h. Pressure Control (**PT-953**): Provide pump with a built-in, factory fitted, pressure controller and sensor enabling control of the outlet pressure via. automatic variable pump speed control.
    1) Manufacturer: Grundfos MBS3000

PART 3 EXECUTION

3 .1 INSTALLATION

A. Install in accordance with the manufacturer's written instructions

B. Accurately locate anchor bolts per manufacturer's recommendations

C. Mount pumps and motors on concrete pads

D. Level, plumb, align and wedge pumps into position to fit connecting piping

E. Maintain alignment of components

F. No strain shall be transmitted to the pump flanges

G. Test pump connections for piping stresses after final alignment and bolting
    1. Loosen flange bolts
    2. If any movement or opening of joints is observed, adjust piping to fit

H. Realign couplings after grouting

I. Do not shim between machined surface

J. Install pressure gauges/sensors at the discharge side of pumps

3 .2 MANUFACTURER'S FIELD SERVICES

A. Provide manufacturer's field service representative for a minimum of 1 day to inspect installation and witness testing.

B. Perform the following pre-operating checks
    1. Loosen flange bolts on pump; if any movement or opening of joint observed, adjust piping to obtain proper fit
    2. Ensure piping is clear of all debris
    3. Check for sufficient lubrication
    4. Check for open suction and discharge valves
    5. Check for closed check valves

6. Check for correct rotation
7. Check for mechanical seal lubrication
8. Re-check alignment after grout completely set and re- align if required

C. Performance Testing
1. Check for proper vibration isolation
2. Check for high-bearing temperature
3. Check flow to mechanical seals for proper flushing
4. Check for motor overload by measuring amperage and voltage on each phase
5. Conduct on-site pump test to verify pump meets design conditions. Provide written report.

D. Manufacturer's representative shall instruct Owners personnel on proper operation of equipment
1. Provide 4 hours minimum of Owner's personnel training after start-up
2. Schedule training with owner at minimum of 14 days prior. Adjust schedule to accommodate Owners operations staff.

END OF SECTION 43 21 13

SECTION 46 05 53 - IDENTIFICATION FOR WATER AND WASTEWATER EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Nameplates.
   2. Tags.
   3. Stencils.
   4. Labels.
   5. Lockout devices.

B. Related Requirements:
   1. Section 09 96 00 – High Performance Coatings: Execution requirements for painting specified by this Section.
   2. Section 40 05 53 – Identification for Process Piping

1.2 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data: Submit manufacturers catalog literature for each product required.

C. Shop Drawings: Submit list of wording, symbols, letter size, and color coding for equipment identification and schedule, including equipment number, location, function, and manufacturer's name and model number.

D. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.

1.3 SUSTAINABLE DESIGN SUBMITTALS

A. Section 01 81 13 - Sustainable Design Requirements: Requirements for sustainable design submittals.

B. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
   1. Provide cost data for the following products:
      a. Salvaged, refurbished, and reused products.
      b. Products with recycled material content.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 78 23 – Operation and Maintenance Data: Requirements for maintenance materials.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved **black** letters on light, contrasting background color.

2.2 TAGS

1. Description:
   a. Laminated three-layer plastic with engraved **black** letters on light, contrasting background color.
   b. Minimum Tag Size and Configuration: 1-1/2-inch **square.**

B. Metal Tags:
   1. Description:
      a. **Brass** construction; stamped letters.
      b. Minimum Tag Size and Configuration: 1-1/2-inch **square** with finished edges.

C. Information Tags:
   1. Description:
      a. Clear plastic with printed **WARNING** and message.
      b. Minimum Tag Size: 3-1/4 by 5-5/8 inch.
      c. Furnish grommet and self-locking nylon ties.

2.3 STENCILS

A. Description:
   1. Clean-cut symbols.
   2. Letter Height: **1-3/4 inch inch**.

B. Stencil Paint: As specified in Section 09 90 00 - Painting and Coating ; semi-gloss enamel.

2.4 LABELS

A. Description:
   1. **Aluminum** construction.
   2. Minimum Size: 1.9 by 0.75 inch.
   3. Adhesive backed, with printed identification **and bar code**.

2.5 LOCKOUT DEVICES

1. Description:
   a. **Anodized aluminum** construction.
   b. Furnish hasp with erasable label surface.
   c. Minimum Size: 7-1/4 by 3 inches.

PART 3 EXECUTION

3.1 PREPARATION

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation preparation.

B. Degrease and clean surfaces to receive adhesive for identification materials.

C. Prepare surfaces as specified in Section 09 90 00 - Painting and Coating for stencil painting.

3.2 INSTALLATION

A. Identify equipment with plastic nameplates.

B. Identify inline pumps and other small devices with tags.

C. Identify control panels and major control components outside panels with plastic nameplates.

D. Apply stencil painting as specified in Section 09 96 00 – High Performance Coatings

E. Install identifying devices after completion of coverings and painting.

F. Install plastic nameplates with corrosion-resistant mechanical fasteners or adhesive.

G. Labels:
   1. Install labels with sufficient adhesive for permanent adhesion and seal with clear lacquer.
   2. For unfinished covering, apply paint primer before applying labels.

H. Install tags using corrosion-resistant chain.

END OF SECTION 46 05 53

SECTION 46 31 11 - CHLORINE GAS FEED EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Vacuum-regulated, gas-feed, automatic switchover, fully automatic, program-control-type chlorination controls, chlorine induction units. Equipment in this section will be furnished by Owner's controls consultant, Control Systems Technology (CST). CST will install all equipment specified in this Section other than PVC piping, valves, fittings and connecting (to plumbing) control equipment (ejector, solenoid valves, etc.).

B. In accordance with the control logic described in Section 25 51 00 – Integrate Automation Control, system shall provide automatic proportional chlorine gas flow control based on production rates (flows) from potable water supply wells.

C. Related Requirements:
1. Section 22 05 29 – Handers & Supports for Plumbing Piping & Equipment
2. Section 22 11 16 – Domestic Water Piping
3. Section 22 11 19 – Domestic Water Piping Specialties
4. Section 25 51 00 – Integrate Automation Control
5. Section 40 05 13.73 – Plastic Process Piping
6. Section 40 05 23 – Common Work Results for Process Valves
7. Section 40 05 23.12 – Ball Valves
8. Section 46 05 53 - Identification for Water and Wastewater Equipment

1.2 REFERENCE STANDARDS

A. The Chlorine Institute, Inc.: Requirements for vacuum regulator mounting assembly.

B. Mining Safety and Health Administration: Requirements for self-contained breathing apparatus.

C. National Electrical Manufacturers Association:
1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. National Institute for Occupational Safety and Health: Requirements for self-contained breathing apparatus.

1.3 COORDINATION

A. Section 01 31 00 – Project Management & Coordination: Requirements for coordination.

B. Coordinate Work of this Section with Owner.

1.4 PREINSTALLATION MEETINGS

A. Section 01 31 00 – Project Meetings: Requirements for preinstallation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.5 SEQUENCING

A. Section 01 11 00 – Summary of Work: Requirements for sequencing.

B. Sequence Work to prevent interference with Owner's operation.

1.6 SUBMITTALS

A. Section 01 33 23 - Submittal Procedures: Requirements for submittals.

B. Product Data:
1. Submit complete information concerning materials of construction, fabrication, and protective coatings.

C. Shop Drawings:
1. Indicate materials and equipment, including wiring and control diagrams, performance charts and curves, installation and anchoring requirements, fasteners, and other details.
2. Submit schematic diagram of each system, including tag marks for each item of equipment cross-referenced to chlorine system equipment list.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Test and Evaluation Reports: Submit certified factory test results.

F. Manufacturer's Instructions:
1. Submit detailed instructions on installation requirements, including storage and handling procedures, anchoring, and layout.
2. Submit installation, selection, and hookup configuration, with pipe and accessory elevations.
3. Submit hanging and support requirements and recommendations.

G. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

H. Manufacturer Reports: Indicate that equipment has been installed according to manufacturer's instructions.

1.7 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Requirements: Requirements for closeout procedures.

B. Project Record Documents: Record actual locations and final orientation of equipment and accessories.

C. Operation and Maintenance Data: Submit maintenance instructions for equipment and

accessories.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Section 01 78 23 – Operations and Maintenance Requirements: Requirements for maintenance materials.

B. Spare Parts:
   1. Furnish one set of manufacturer's recommended spare parts, including:
      a. One flow rate indicator for each vacuum regulator.

C. Tools: Furnish special wrenches and other devices required for Owner to maintain and calibrate equipment.

1.9 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum ten years' documented experience.

B. Installer: Company specializing in performing Work of this Section with minimum three years' experience.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 67 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver materials in manufacturer's packaging; include installation instructions.

C. Inspection: Accept equipment on-Site in manufacturer's original packaging. Inspect for damage.

D. Store products according to manufacturer's instructions and in areas protected from weather, moisture, or possible damage.

E. Protect systems from entry of foreign materials by using temporary covers and by isolating parts of completed system.

1.11 WARRANTY

A. Section 01 77 00 – Closeout Procedures: Requirements for warranties.

B. Furnish three-year manufacturer's warranty for all electrical and mechanical equipment.

PART 2 - PRODUCTS

2.1 CHLORINE FEED SYSTEM

A. Manufacturers:

1. Regal, no other substitution allowed.

B. Description:
   1. Feed System: Vacuum-operated, solution-feed, automatic switchover chlorinator for dispensing chlorine gas from standard 150 lbs cylinders.
   2. Pressure Relief Valve: Allows pressurized gas an avenue of escape when necessary. Vents outside chlorine room.
   3. Chlorinator: Cylinder mounted chlorine gas feed and regulator system.
   4. Ejector: Provides operating vacuum for feed system.
   5. Automatic Control Valve: Microprocessor based automatic control valve shall adjust the gas feed rate based on well flow rate received as a 4-20mA input.
   6. Induction Unit: Provides operating vacuum for feed system.

A. Performance and Design Criteria:
   1. Chlorine Gas Feed Capacity: 25 lb/day.
   2. Flow Proportional Control: 0- 25 lb/day with Compound Loop Control capability.
   3. Automatically switch gas supply from empty cylinder to full cylinder.

B. Vacuum Gas Regulator: **CHL-061 & 062** (supply 2 each)
   1. Manufacturer/Make: Regal Model 216 Direct Mount Chlorinator with automatic switchover capability
   2. Mounting: On gas cylinder valve by means of corrosion-resistant, gasketed yoke assembly conforming to standards of The Chlorine Institute, Inc.
   3. Vacuum Control: Tantalum inlet valve springs opposing diaphragm that closes tightly upon loss of vacuum. Provide with rate valve for chlorine gas feed adjustment.

C. Pressure Relief Valve: **CHL-063**
   1. Manufacturer/Make: Regal
   2. Furnish separate ports for chlorine feed and chlorine vent.
   3. Vent gas away from pressure relief port to atmosphere outside of building; furnish insect screen at end of vent.
   4. Furnish inlet filter to remove particulate matter from the gas before it enters inlet safety valve.
   5. Furnish with chlorine gas flowmeter (**CHL-951, CHL-1051**) to indicate gas feed rate.
      a. Manufacturer/Make: Regal 7500
      b. Gas Flow Rate Range: Maximum 50 lb./day and minimum of 1/20 of maximum rate.
      c. Control valve for manual feed rate adjustment.
      d. Mounting: Wall.
   6. Body machined from solid PVC.
   7. Vacuum regulator shall have a two-layer diaphragm, which controls vacuum and a spring loaded, normally closed inlet safety valve, which closes upon loss of vacuum.

D. Automatic Control Valve: **CHL-952, CHL-1052**
   1. Manufacturer/Make: Regal SmartValve Model 7001
   2. Mounting: Wall
   3. Gas Flow Rate: 25 lb./day.
   4. Control: Flow pace based on total well(s) flow rate as reported by the PLC-100.

5. Capability of Compound Loop Control. PID controller and variable area orifice.

E. Ejector Assembly: **CHL-954, CHL-1054**
1. Manufacture: Regal Ejector with 3A nozzle.
2. Type: Water-operated venturi nozzle.
3. Automatic gas flow shutoff upon loss of water supply.
4. Ejector check valve shall automatically close upon the loss of vacuum in the injector.
5. Back Pressure: Suitable for no less than 145 psig.

F. Mounting: Wall mounted with required piping connections for gas and ejector supply water and discharge.

2.2 MATERIALS

A. Chlorine Vent and Vacuum Tubing:
1. Chlorine Gas Tubing and Fittings: 3/8" VT-1 Polyethylene, and/or size and type as recommended by chlorinator manufacturer.

B. Rigid Chlorinated Water Piping:
1. PVC Piping and Fittings: ASTM D1785 SCH80 PVC, size per plan. Comply with Section 40 05 13.73 - Plastic Process Piping.

2.3 ACCESSORIES

A. Ball Valves:
1. As specified in Section 40 05 23.12 - Ball Valves.

B. Cylinder Scale: **CHL-060**
1. Manufacturers:
a. Regal Model ECS402 w/ two weighing platforms
b. Substitutions: Section 01 67 00 - Product Requirements.
2. Description: Dual-cylinder electronic scale with weighing platforms consisting of low-profile scale bases with corrosion resistant finishes.
3. Stainless steel electronic strain gage load cells and hardware. Cylinder stops. Wall mount brackets with cylinder retaining chains.
4. Furnish scale controller with two indicators and two tare-weight adjustments.
5. Accuracy of Tare Weight Adjustment: 1 percent of full scale.
6. Indicator to display net weight of each cylinder.
7. Gross Capacity of Each Scale Platform: 300 lb.
8. Tare Capacity Range: Zero to 300 lb. with readability to 0.1 lb.
9. Indicators:
a. Two independent digital displays.
b. Electrical Characteristics: 115 V, single phase, 60 Hz.
c. Enclosure: NEMA 250, 4X.
d. 4-20 mA outputs with low cylinder weight alarm relays to SCADA per Section 25 51 00.
e. Gross or Net cylinder weight.

f. Auto zero feature with back-up pushbutton

10. Finishes: Scale materials and coatings suitable for use in chlorine atmosphere.

C. Chlorine Gas Leak Detector: **CHL-065**

1. Manufacturers:
   a. Regal Model 3000
   b. Substitutions: Section 01 67 00 - Product Requirements.
2. Operation: The chlorine gas sensor shall be an electrochemical type (requiring no chemical additions), housed in a corrosion resistant Nema 4X enclosure suitable for wall mounting. In the presence of chlorine gas, a current flow will develop and be transmitted through electrical wiring to the receiver.
3. The sensor shall be mounted within 12 inches from the floor in the Chlorination room.
4. The receiver shall process and display incoming signals from the sensor module.
5. The receiver shall be housed in a Nema 4X enclosure suitable for wall mounting.
6. The receiver shall contain the following components:
   a. Power Switch and LED Indicators for "POWER" and "READY" shall be provided.
   b. An LED alarm indicator shall illuminate and an annunciate (horn), rated at 95 decibels, shall sound in the event the preset ppm level set-point is exceeded and, a corresponding contact closure shall be activated at the same time as the alarm for a red warning light. The contact relay shall be rated 10 amps at 240V AC maximum, resistive or inductive load, SPDT or DPDT by jumper selection, and shall be manual reset (latching) or automatic reset (unlatching) by jumper selection.
   c. The light and annunciate shall be rated for outdoor installation and by the same manufacturer as the chlorine gas detector equipment.
   d. An LED malfunction indicator shall illuminate when the minimum signal, required from the sensor, is not maintained.
   e. A reset button shall be provided for clearing the alarm and malfunction after the conditions have been corrected.
   f. A timer shall be provided, and activated when the receiver is powered. This will allow the sensor to stabilize. Upon completion of stabilization, the ready indicator shall illuminate indicating the alarm and malfunction modes are enabled.
   g. An LED Indicator shall be visible on the face of the receiver to allow visual reference to the presence of chlorine gas.
   h. A 4-20 mA DC output signal shall be provided to transmit the scanned level of chlorine detected with alarm. The maximum load impedance shall not exceed 900 ohms. Chlorine detection level and alarm shall output to the Town's water system SCADA per Section 25 51 00.
7. Ambient Temperature operating range shall be minus 2 degrees F to 120 degrees.
8. The minimum detectable concentration of chlorine gas shall be 0.5 ppm by volume.
9. Power shall be provided for 120V AC, 60 Hz single phase. A battery terminal shall be provided for use in the event of a power failure.

2.9 SAFETY

A. Safety Signs: Furnish and install hazard identification signs as specified in IFC 5003.5 at the entrance to the chlorination room. Placard regulations shall be posted as follows; Health risk of 3, flammability of 0, reactivity of 0, special hazard of "oxy". A set of safety signs shall be provided for chlorine warning, hazards, and emergency instructions.
   1. Sign #1 shall indicate "Danger, Chlorine".
   2. Sign #2 shall indicate "Chlorine Hazards", then shall list the properties of chlorine gas, exposure effects, and an accident instruction chart.
   3. Sign #3 shall indicate "Chlorine Emergency Instructions", then shall list additional properties of chlorine gas, emergency instructions, and first aid procedures.
   4. Sign #4 shall indicate "Smoking Prohibited" in the building.

B. Emergency Repair Kit: Kit A for 150 lb chlorine cylinders as approved by the Chlorine Institute.

C. Breathing Apparatus: MSA 30-minute self-contained breathing apparatus shall be mounted in a location near (but not inside) the room containing Chlorine gas. The apparatus shall be enclosed in a wall mounted enclosure especially designed, labeled and color coded for this purpose.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Section 01 73 40 - Execution Requirements: Requirements for installation examination.

B. Verify layout and orientation of equipment, accessories, and piping connections.

3.2 INSTALLATION

A. Install equipment and accessories as recommended by manufacturer and as indicated on Drawings.

B. Install chlorine vent and vacuum tubing in Schedule 80 PVC pipe to location outside of building wall. Install turned-down elbow and terminate with fine mesh insect screen.

C. Install weather rated annunciator (horn) and warning light for the chlorine gas detector exterior to the building and adjacent to the entry door at a location approved by Engineer.

D. Install safety apparatuses in Engineer approved locations.

3.3 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for inspecting and testing.

B. Installation of the Chlorination System shall be per manufacturer's recommended and approved procedures submitted with shop drawings, and with the recommendations of the

Chlorine Institute, Inc. A local factory representative shall perform necessary and appropriate start-up functions, and shall provide operator training for one day.

C. Preliminary Leakage Testing: Pressurize entire chlorine system with nitrogen to at least 150 psig. With system under pressure, test each joint and connection for leaks by applying soapy water to each joint and connection.

D. Final Leakage Testing: Test automatic chlorinators first to ensure chlorinators are operational. Use chlorinators to evacuate system in event leaks are found. Perform in the following sequence:
   1. Check unions and pipe connections in chlorine system for tightness.
   2. Open header and auxiliary valves one turn.
   3. Soak rag with strong ammonia water (commercial 26-degree Be), and swab each joint and connection.
   4. Momentarily open one chlorine cylinder valve to pressurize system to approximately 10 psig, then shut off tight; observe chlorine leaks evident by formation of dense, white smoke.
   5. When leaks are found, turn on automatic chlorinators to evacuate system, then repair leaks; retest joints and connections after repairs are made.

E. Performance Testing: Test each piece of chlorination equipment under design conditions for two to four hours to demonstrate proper functioning and automatic regulation of system; test alarms and signal generation; exercise equipment control and manual override where applicable; demonstrate equipment safety features.

F. Equipment Acceptance: Adjust, repair, modify, or replace components failing to perform as specified, and rerun tests; make final adjustments to equipment under direction of manufacturer's representative.

G. Manufacturer Services: Furnish services of manufacturer's representative experienced in installation of products furnished under this Section for not less than 1 day on-Site for installation, inspection, field testing, and instructing Owner's personnel in maintenance of equipment.

H. Furnish installation certificate from equipment manufacturer's representative attesting equipment has been properly installed and is ready for startup and testing.

3.4 CLEANING

A. Section 01 73 40 - Execution Requirements: Requirements for cleaning.

B. Clean portions of chlorine system to remove cutting oil, grease, and other foreign materials; do not use hydrocarbons or alcohols for cleaning residuals from these materials.

C. Before use, dismantle and clean new valves or other equipment received in oily condition. Test valves with clean, dry air at 150 psig for seat tightness before installation.

D. Dry chlorine piping before use using steam and dry air; if steam and dry air are not available, purge completed system with dry cylinder air or nitrogen to remove moisture.

3.5 DEMONSTRATION

A. Section 01 73 40 - Execution Requirements: Requirements for demonstration and training.

B. Demonstrate equipment startup, shutdown, routine maintenance, and emergency repair procedures to Owner's personnel.

END OF SECTION 46 31 11

SECTION 46 33 44 - PERISTALTIC METERING PUMPS

1.00 DESCRIPTION

A. Scope:

1. Metering pumps shall be furnished by Owner (**by Others**) through Control Systems Technology (CST) and installed by Contractor.

2. Contractor shall provide all labor, materials, equipment, and incidentals required to install, test and place in satisfactory operation, positive displacement peristaltic metering pumps with self-contained variable speed drives as shown and specified herein. All pumps specified in this section shall be provided from one single pump Supplier. This Section includes:

a. Metering pumps complete with pumps, piping, and appurtenances shown on the drawings as typical for the metering pump operation.

B. Coordination:

1. Review installation procedures under this and other Sections and coordinate installation of items that must be installed with or before peristaltic metering pumps and appurtenances Work.

C. Related Sections:

1. Section 25 30 00 - Instrumentation and Control for Process Systems

2. Section 25 51 00 - Integrated Automation Control of Facility Equipment

3. Division 26 – Electrical

4. Division 40 – Process Integration

1.01 REFERENCES

A. Standards referenced in this Section are:

1. American Bearing Manufacturers Association, (ABMA).

2. American Gear Manufacturers' Association (AGMA).

3. American National Standards Institute (ANSI).

4. API 675, Positive Displacement Pumps Controlled Volume.

5. American Society for Testing and Materials (ASTM).

6. Institute of Electrical and Electronics Engineers (IEEE).

7. National Electrical Code (NEC).

8. National Sanitation Foundation (NSF).

1.02 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Shall have minimum of three years experience producing substantially

similar equipment to that required and shall be able to show evidence of at least five installations in satisfactory operation for at least three years.

B. Component Supply and Compatibility:

1. Obtain all materials and equipment included in this Section regardless of component Manufacturer, from a single pump Supplier, certified by the Manufacturer to provide the specified equipment.

2. Peristaltic tube metering pump Manufacturer shall review and approve or prepare all Shop Drawings and other submittals for all components furnished under this Section.

3. Materials and equipment shall be fully compatible with specified service conditions, and shall be integrated into overall assembly by peristaltic tube metering pumps and appurtenances equipment Supplier.

C. Quality Assurance - This specification is the basis for design for peristaltic pumps. All pumps, whether named as an acceptable supplier or submitted as an equal must, at a minimum, meet the following critical design requirements.

1. Tube pumps shall be 100% integral in design, with the pump head, motor, controls, and pump case being a single unit. All controls, motor, and gear reduction shall be housed in a single, chemically resistant pump case.

2. Hose pumps shall be provided with separate base plates, external gear reduction and/or gear motors, and separate controls and VFDs, as required.

3. Pumps shall be dry self-priming, capable of running dry without damaging affects to the pump or tube.

4. Tube pump drives and pump heads shall be 24-hr continuous duty rated and have a minimum five-year manufacturer's warranty from date of shipment.

5. Hose pump drives and pump heads shall be 24-hr continuous duty rated and have a minimum two-year manufacturer’s warranty from date of shipment.

6. Supplier must provide Certificate of Compliance with Section 1.3.C Quality Assurance with its submittal.

1.03 SUBMITTALS

A. Action Submittals: Submit the following:

1. Shop Drawings:

a. Performance curves specific to each pump model with 5 different speeds for the specific chemical being pumped.

b. Complete layout and installation drawings for each feed pump showing mounting details, dimensions, fitting locations, and materials of construction.

c. Wiring diagrams.

d. The manufacturer shall certify in writing that the design application has been reviewed, and that the equipment will thoroughly and efficiently meet the performance requirements of this application.

e. Statement of material compatibility with each specified chemical.

f. Certificate of Compliance with Section 1.3.C Quality Assurance.

g. Manufacturer's literature, catalog cuts, and specifications for skids and accessories, showing dimensions and materials of construction.

2. Product Data:

a. Complete product data for each size and type of pump, motor, and accessories, including manufacturer's brochure, specifications, weight, performance data, motor speed, turndown, and capacity.

3. Testing Plans:

a. Source quality control testing plan.

b. Field quality control testing plan.

B. Informational Submittals: Submit the following:

1. Certificates:

a. Paint certification.

2. Manufacturer's Instructions:

a. Setting drawings, templates, and directions for installing anchor bolts and other anchorage devices.

b. Instructions for handling, storing, and installing equipment.

3. Source Quality Control Submittals: Results of source quality control tests and inspections.

4. Field Quality Control Submittals: Results of field quality control tests.

5. Manufacturer's Reports: Submit a written report of results of each visit to Site by Supplier's service technician, including purpose and time of visit, tasks performed, and results obtained.

6. Qualifications Statements: When requested by Engineer, submit qualifications data for manufacturer.

C. Closeout Submittals:

1. Operation and Maintenance Data:

a. Furnish Operation and Maintenance Manuals specific to the equipment and materials supplied. Annotate any standard charts, tables, or information to clearly identify the equipment and materials supplied. Standard, off the shelf operations and maintenance data that has not been annotated, and does not specify or indicate the key elements of the equipment and materials supplied, will be rejected.

b. Provide an electronic portable document format (PDF) of the approved operation and maintenance manuals.

2. Spare Parts, Extra Stock Materials, and Tools as required in Part 2 of this Specification.

1.04 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading:

1. Deliver materials and equipment to Site to ensure uninterrupted progress of the Work.

Deliver anchorage materials to be embedded in concrete in ample time to prevent delaying the Work.

2. Inspect all boxes, crates, and packages upon delivery to the Site and notify Owner's Representative in writing of loss or damage to products. Promptly remedy loss and damage to new condition in accordance with manufacturer's instructions.

B. Storage and Protection:

1. Keep materials and equipment off ground using pallets, platforms, or other supports. Protect steel, packaged materials, and electronics from corrosion, deterioration, and construction activities that could result in damage. Secure delivered equipment and materials from theft. In flood risk areas, the Contractor is responsible to protect equipment and materials from damage due to high water, rain, or flooding events.

C. Acceptance at Site:

1. All boxes, crates and packages shall be inspected by Contractor upon delivery to the Site. Contractor shall notify Owner's Representative, in writing, if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition in accordance with manufacturer's instructions.

1.05 MAINTENANCE

A. Spare Parts, Extra Stock Materials, and Tools:

1. Spare parts shall be furnished with the equipment by the manufacturer. The following spare parts shall be furnished for each unit furnished under this Section:

a. For each application, two replacement hose/tube elements. Element shall be prepared for long term storage; adequate lubrication for two element changes shall be provided.

b. One quart of touch up paint.

c. Two complete sets of any special tools required for normal maintenance

1.06 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights or remedies Owner may otherwise have under the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under the Contract Documents. Obligations of Contractor under the Contracts Documents shall not be limited in any way by provisions of the specified special warranty.

B. Special Warranty: Provide manufacturer's written warranty, running to the benefit of Owner, agreeing to correct, or at option of Owner, remove or replace materials and equipment specified in this Section found to be defective during a period of 2-year afterS date of Substantial Completion of the Work under this Section.

2.00 PRODUCTS

2.01 MANUFACTURERS

A. Products and Manufacturers: Tag Series **P-931, P-1031**

1. Pulsatron Model LMB3TA-VTC1-U04, no other substitutions allowed
2. Application: All wetted surfaces of the pumps and all sealing gaskets shall be suitable for continuous exposure to 3.375% phosphoric acid.
3. Tubing: PE (white)
4. Feed Rate: 0 to 12 gpd
5. Maximum Operating Pressure: 300 psi
6. Operation: Proportional automatic speed control base on well flow rate in accordance with Section 25 51 00 - Integrated Automation Control of Facility Equipment
7. Speed Input: 4-20mA

2.01 EQUIPMENT PERFORMANCE

A. System Description:

1. Provide peristaltic metering pumps, complete with pump head, flexible extruded tube, motor, controls, and variable speed drive.
2. Tube pumps shall be 100% integral in design, with the pump head, motor, controls, gear reduction and pump case being manufactured by the pump manufacturer themselves.
3. Hose pumps can be provided with base plates, external gear reduction and/or gear motors, and separate controls and VFDs, as required.
4. Provide equipment compatible with specified service conditions, and able to meet the flow and head requirements.

2.03 APPURTENANCES

A. Pump Stand:

1. Provide chemical resistant stand for mounting pumps as shown on Drawings.
   a. Pump height on stand shall be as shown on the drawings, but not lower than 2.5 feet above the finished floor elevation.
2. The pump stand shall support pump skid assemblies as indicated on the Drawings, including but not limited to: isolation valves, check valves, pressure gauges, pressure relief valves, and calibration columns.

2.04 FINISHING

A. Shop Painting:

1. Surface preparation and painting shall be manufacturer's standard coat epoxy.
2. Apply in the shop primer coating to metallic parts (excluding surfaces exempted) of pumps, motors, drives, frames, supports, and appurtenances.
3. Do not paint corrosion-resistant parts such as plastic, fiberglass, and stainless steel.
4. Gears, bearing surfaces, machined surfaces, and other surfaces that are to remain unpainted shall receive heavy application of grease or other rust-resistant coating. Maintain coating during storage and until equipment is placed into operation.
5. Chemical resistant powder coating is acceptable.

2.06 METERING PUMP STANDS

A. Pump stands shall be manufactured to support chemical metering pumps, all necessary piping, valves, fittings, supports, electrical controls, and accessories as specified herein. The stand shall include a perimeter drip lip that will drain leaks to a drain nozzle connection. The Contractor shall install a 5/8" hose to drain leaks to the floor.

B. The stands shall be constructed of chemical resistant materials such as polypropylene, polyethylene, FRP, or approved equal.

C. Piping shall be secured to the stand in accordance with Section 40 05 29, Pipe Hangers and Supports.

3.00 EXECUTION

3.01 INSPECTION

A. Examine conditions under which products are to be installed and notify the Owner's Representative in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install materials and equipment in conformance with Laws and Regulations, applicable standards, manufacturer's instructions and recommendations, and the Contract Documents.

B. Anchorages and Base Plates:

1. Provide anchorages in accordance with equipment manufacturer's recommendations and the Contract Documents.

C. General:

1. Perform drilling and fitting required for installation. Set equipment accurately in location, alignment, and elevation, plumb, true, and free of rack.
2. Making plate cutouts or openings at the Site is not allowed.
3. Fit exposed connections accurately together to form tight hairline joints.
4. Provide utility connections in accordance with the Contract Documents.
5. Align and adjust equipment including motors, belts, drives, support stands, and appurtenances in presence of Engineer.
6. Prior to energizing electric motor drive equipment, rotate drive motor by an external source to demonstrate free operation of all mechanical parts. Do not energize equipment until safety devices are installed, connected, and functional.
7. Install valves in accordance with applicable provisions of Division 40 – Process Integration

D. Conform to Section 01 91 14, Starting and Adjusting.

3.03 FIELD QUALITY CONTROL

A. Site Tests:

1. Following installation, Contractor and qualified field service representative of Supplier shall conduct operating tests of all equipment, functions, and controls at the Site in presence of Engineer.
2. Comply with Section 01 73 40, Execution and Closeout Requirements.
3. Field Operating Test:
    a. Manufacturer to provide calibration curve based on field capacity/speed test.
    b. Field test equipment and its controls in local mode, followed by demonstrating proper operation and controls in automatic mode. Demonstrate that each part individually and all parts together function properly in manner intended. Total duration of testing shall be 48 hours, continuous and uninterrupted, in automatic mode. All testing equipment and labor shall be by Contractor.
    c. Should tests result in malfunction, make necessary repairs, revisions, and adjustments and restart test from the beginning. Repeat tests and repairs, revisions, and adjustments until, in opinion of Engineer, installation is complete and equipment is functioning properly and accurately, and is ready for permanent operation.

B. Manufacturer's Services: Provide a qualified, factory-trained serviceman to perform the following:

1. Instruct Contractor in installing equipment.
2. Supervise installation of materials and equipment.
3. Inspect, calibrate, adjust, and test equipment after installation and ensure proper operation.
4. Instruct Owner's personnel in operating and maintaining the equipment.

END OF SECTION 46 33 44

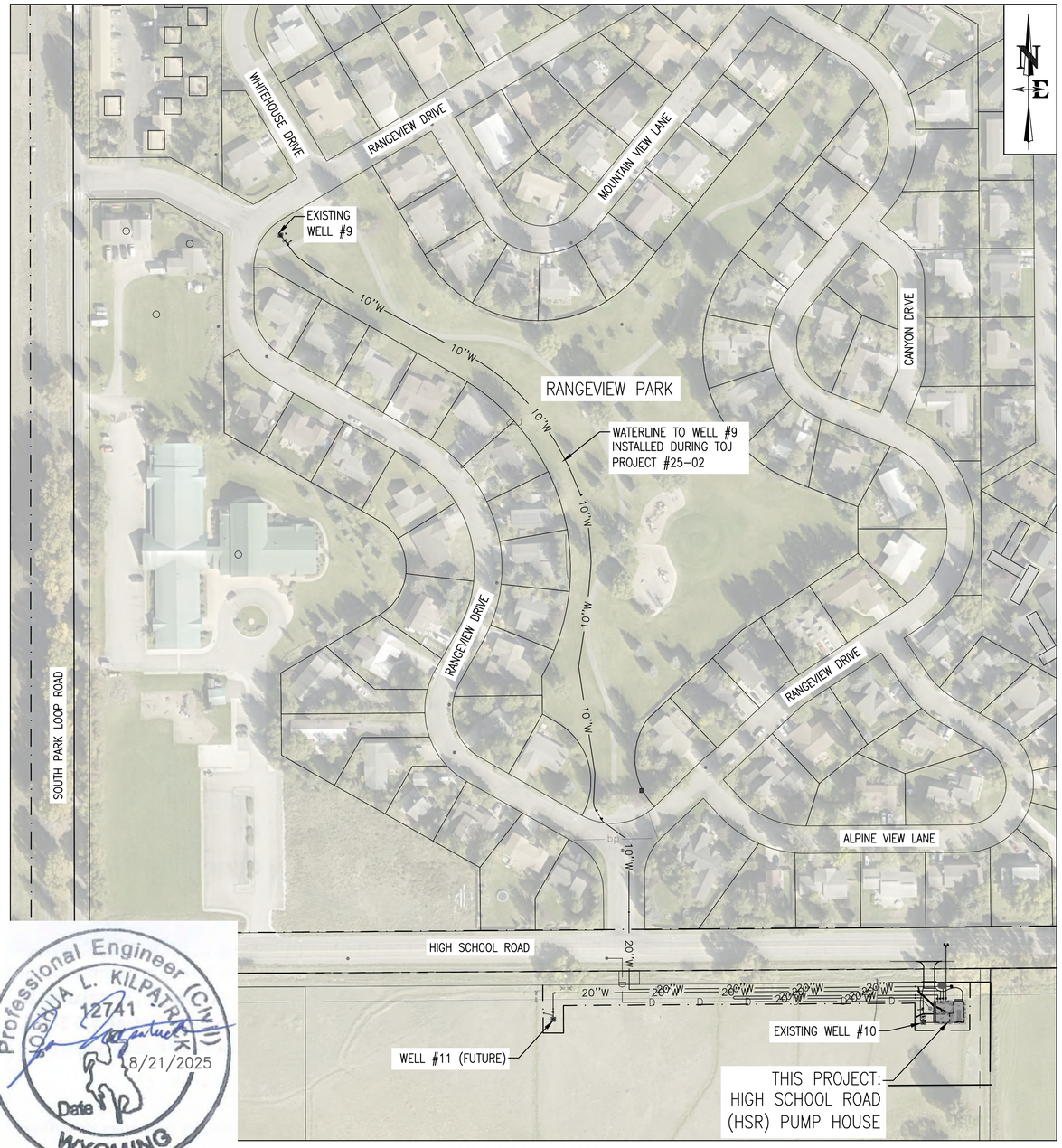
SECTION IV

DRAWINGS

HIGH SCHOOL ROAD PUMP HOUSE
TOWN OF JACKSON
PROJECT 26-06
JACKSON, WYOMING
AUGUST 2025

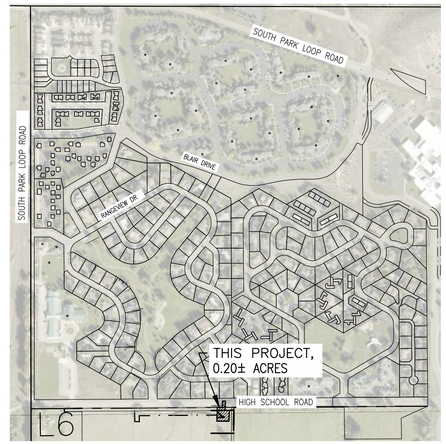
DRAWING INDEX

DWG NO.	DRAWING TITLE
CIVIL	
T1.0	COVER SHEET
G1.0	PID SYMBOLS
G1.1	PID - WELLS 9 & 10
G1.2	PID - WELL 11
G1.3	PID - CHLORINE ROOM
G1.4	PID - IRON & MAGNESE TREATMENT
G1.5	PID - PUMP HOUSE
P1.0	PUMP HOUSE PROCESS PLAN
P1.1	PUMP HOUSE PROCESS DETAILS
P1.2	PUMP HOUSE UNDERGROUND PIPING PLAN & PROCESS DETAILS
P1.3	PUMP HOUSE PROCESS DETAILS
P1.4	WELL NO. 9 & 10 DETAILS
C1.0	PROJECT SITE PLAN
C1.1	HSR PUMP HOUSE SITE PLAN
C1.2	HSR PUMP HOUSE GRADING PLAN
C2.0	UTILITY DETAILS
C2.1	UTILITY DETAILS
ARCHITECTURAL	
G1.0	COVER
G1.1	SCHEDULES
G1.2	WALL, FLOOR, & ROOF TYPES
G1.3	CODE ANALYSIS
A1.0	FOUNDATION PLAN
A1.1	FLOOR PLAN
A1.2	ROOF PLAN
A3.1	BUILDING ELEVATIONS
A3.2	BUILDING ELEVATIONS
A4.1	BUILDING SECTIONS
A5.1	WALL SECTIONS/DETAILS
A5.2	WALL SECTIONS/DETAILS
STRUCTURAL	
S1.0	GENERAL STRUCTURAL NOTES
S1.1	GENERAL STRUCTURAL DETAILS
S2.0	STRUCTURAL FRAMING PLANS
S3.0	STRUCTURAL SECTIONS
S4.0	STRUCTURAL FOUNDATION & FRAMING DETAILS
MECHANICAL	
M0.0	MECHANICAL COVER SHEET
M0.1	MECHANICAL SPECIFICATIONS
M0.3	MANUAL J,S
M1.0	MAIN LEVEL FORCED AIR PLAN
M2.0	MECHANICAL DETAILS & CONTROL SEQUENCES
M3.0	MECHANICAL SCHEDULES
FIRE PROTECTION	
FX001	SITE PLAN, RISER, DETAILS AND LEGEND, FIRE SPRINKLER PLAN
ELECTRICAL	
E0.0	ELECTRICAL COVER SHEET
E0.1	ELECTRICAL SPECIFICATIONS
E1.0	POWER MAIN LEVEL
E2.0	LIGHTING MAIN LEVEL
E3.0	ONE LINE DIAGRAM
E4.0	PANEL SCHEDULES
LANDSCAPING & IRRIGATION	
IR1.0	IRRIGATION NOTES & SCHEDULE
IR2.1	IRRIGATION PLAN
IR3.1	IRRIGATION DETAILS
IR3.2	IRRIGATION DETAILS
L1.0	PLANTING PLAN



PROJECT AREA

0 100 200



VICINITY MAP

RANGEVIEW PARK, NORTH END
NW¼ OF SW¼ OF SECTION 6
T40N R116W
JACKSON, WYOMING

0 500 1000

N E

CONSTRUCTION NOTES:

CAUTION: UNDERGROUND UTILITY LOCATIONS ARE NOT GUARANTEED, NOR IS THERE ANY GUARANTEE THAT ALL EXISTING UTILITIES (WHETHER FUNCTIONAL OR ABANDONED) WITHIN THE PROJECT AREA ARE SHOWN ON THESE DRAWINGS. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL UNDERGROUND UTILITIES BEFORE STARTING WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGE RESULTING FROM CONTRACTORS WORK.

1. PRIOR TO THE PRECONSTRUCTION MEETING, CONTRACTOR SHALL PROVIDE A PLAN AND SCHEDULE DETAILING CONSTRUCTION OPERATIONS FOR ENGINEER REVIEW. AT A MINIMUM, PLANS SHALL INCLUDE DETAILS REGARDING CONSTRUCTION STAGING, LOCATION OF TEMPORARY FACILITIES, AND TRAFFIC CONTROL.
2. ALL WORK IS LIMITED TO 7AM THROUGH 7PM, MONDAY – FRIDAY. WORK IS NOT ALLOWED ON WEEKENDS OR LEGAL HOLIDAYS WITHOUT PRIOR CONSENT FROM OWNER.
3. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL PERFORM EXPLORATORY EXCAVATION TO IDENTIFY ACTUAL LOCATIONS FOR CONNECTION POINTS AND AT LOCATIONS DESIGNATED IN PLAN (IF ANY), OR AS REQUESTED BY ENGINEER. CONTRACTOR SHALL WORK CLOSELY WITH THE ENGINEER TO ESTABLISH THESE LOCATIONS. THE LOCATION AND ELEVATION OF EXISTING UTILITIES SHALL BE NOTED ON PROJECT AS-BUILTS PRIOR TO BACKFILL.
4. ONSITE MATERIALS TESTING FOR SUB-BASE, CRUSHED BASE, CONCRETE, AND ASPHALT WILL BE PROVIDED BY OWNER. CONTRACTOR SHALL COORDINATE SCHEDULE FOR MATERIALS TESTING WITH OWNER/ENGINEER.
5. CONSTRUCTION STAKING FOR PUMP HOUSE AND ASSOCIATED FACILITIES WILL BE PROVIDED BY OWNER. CONTRACTOR SHALL GIVE A MINIMUM OF 5-DAYS ADVANCED NOTICE TO OWNER/ENGINEER FOR CONSTRUCTION STAKING. ONE-TIME STAKING WILL BE PROVIDED FOR PUMP HOUSE AND WATER TRANSMISSION MAIN (MAX. TWO TRIPS). ADDITIONAL STAKING WILL BE PROVIDED ACCORDING AT THE OWNER/ENGINEER'S DISCRETION, AND MAY BE AT THE EXPENSE OF CONTRACTOR.
6. PUMP HOUSE AND CONSTRUCTION STAGING SITES SHALL BE SECURED FROM THE PUBLIC WITH SLATTED CHAIN-LINK FENCING. SOUTH OF HIGH SCHOOL ROAD, AND WITHIN THE "EASEMENT" AREA/CONSTRUCTION LIMITS, CONTRACTOR SHALL CONSTRUCT A TEMPORARY FENCE (350 +/- L.F.) TO KEEP CATTLE FROM ENTERING THE CONSTRUCTION ZONE. THE FENCE MUST BE APPROPRIATE TO PREVENT ENTRY OF CATTLE WITHOUT HARM TO THE ANIMALS. THE FENCE SHALL BE REMOVED FOLLOWING CONSTRUCTION.
7. CONTROLS PROGRAMING, AS WELL AS, EQUIPMENT IDENTIFIED ON THE PROCESS ("P") SHEETS WILL BE SUPPLIED BY TOJ THROUGH CONTROL SYSTEMS TECHNOLOGY (CST).
8. WORK SHALL BE CONDUCTED IN ORDER TO MINIMIZE DAMAGE TO EXISTING SURFACE IMPROVEMENTS; STREETS, LANDSCAPING, ETC.. EXCESSIVE DAMAGE CAUSED BY CONTRACTOR NEGLIGENCE SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
9. ALL WORK SHALL COMPLY WITH THE TETON COUNTY, WYOMING LAND DEVELOPMENT REGULATIONS AND CODE COMPLIANCE REQUIREMENTS WITHIN THE MOST CURRENT ADOPTED VERSION OF THE "COUNTY BUILDING CODES RESOLUTION" FOR TETON COUNTY, WYOMING. CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITTING, INCLUDING BUT NOT LIMITED TO, ELECTRICAL, PLUMBING AND FIRE SPRINKLER SYSTEMS AND WORK. ALL ELECTRICAL, PLUMBING AND FIRE SPRINKLER SUBCONTRACTOR'S SHALL BE LICENSED ACCORDING TO TETON COUNTY REQUIREMENTS.
10. BUILDING AND SITE CONSTRUCTION SHALL COMPLY WITH ALL APPLICABLE TETON COUNTY CODES LISTED IN THE MOST RECENT "COUNTY BUILDING CODE RESOLUTIONS" AND THE TETON COUNTY LAND DEVELOPMENT REGULATIONS.
11. ALL DISTURBED AREAS LOCATED OUTSIDE PARKING AREAS SHALL BE TOPSOILED AND HYDROSEEDED IN ACCORDANCE WITH SECTION 32 92 19.16.
12. REPAIR ALL DAMAGED LANDSCAPING AND IRRIGATION TO PRE-CONSTRUCTION CONDITIONS. REPAIRS TO IRRIGATION SHALL BE INSPECTED AND APPROVED BY OWNER/ENGINEER PRIOR TO BACKFILL.
13. IN ACCORDANCE WITH TETON COUNTY LDRs, TRASH/REFUSE SHALL BE STORED IN BEAR RESISTANT CONTAINERS DURING AND AFTER CONSTRUCTION. RECYCLING SHALL BE STORED INDOORS AND HAULED TO AN ESTABLISHED RECYCLING FACILITY.

Professional Engineer (Civil)
JOSHUA L. KILPATRICK
12741
8/21/2025
Date
WYOMING

PROJECT CONTACTS

OWNER:
TOWN OF JACKSON
BRIAN LENZ
TOWN ENGINEER
450 W SNOW KING AVE
JACKSON, WY 83001
PH: 307-739-4547
EMAIL: blenz@jacksonwy.gov

CIVIL ENGINEER & PROJECT MANAGER:
NELSON ENGINEERING
JOSH KILPATRICK
430 SOUTH CACHE STREET
JACKSON, WY 83001
PH: 307-690-2086
EMAIL: jkilpatrick@nelsonengineering.net

DATE	01/06/2025	REV.
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE: COVER SHEET

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: T1.0

JOB NO: 23-302-02

S:\Proj\2023\302-02 Hsr pump house and water supply facilities\4 drawings\CIVIL\PID #09 Well House Site Plan.dwg [T1.0 COVER SHEET FOR WELLHOUSE] - Aug 28 2025 09:59:58 am PLOTTED BY Josh Kilpatrick DWG TO PDF.pc3

VALVE SYMBOLS

CLOSED OPEN

- GATE VALVE
- KNIFE GATE VALVE (K)
- PLUG VALVE
- GLOBE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- SWING CHECK VALVE
- PILOT OPERATED PRESSURE REDUCING VALVE W/ DOWN STREAM PRESSURE SETTING
- PILOT OPERATED PRESSURE REDUCING VALVE W/ UP STREAM PRESSURE SETTING
- ARV — AIR RELEASE VALVE
- S — SOLENOID OR MOTOR
- REGULATED SIDE PRESSURE CONTROL VALVE

INSTRUMENTATION LEGEND

- 1 — EQUIPMENT LOCATION TAG
- DATA LINK OR SOFTWARE SIGNAL
- ELECTRICAL SIGNAL
- ELECTRICAL CONDUCTOR
- ELECTRICAL ANALOG SIGNAL
- ELECTRICAL DISCRETE SIGNAL

P&ID EQUIPMENT SYMBOLS

DRY PIT WET PIT

- CENTRIFUGAL PUMPS (P#)
- SUBMERSIBLE SUMP PUMP (P#)
- PROGRESSING CAVITY PUMP (P#)
- GEAR PUMP OR BLOWER (POSITIVE DISPLACEMENT)
- COMPRESSOR (CENTRIFUGAL) OR BLOWER
- ROTARY LOBE PUMP
- ROTARY LOBE BLOWER
- INLINE GRINDER
- HANDLE OR THROTTLE
- M — FLOW METER
- PT — PRESSURE TRANSDUCER
- PS — PRESSURE SWITCH
- M — ELECTROMAGNETIC FLOWMETER
- AVS — AUTOMATIC VALVE STATION SOLENOID
- PROCESS ANALYZER/PRESSURE TRANSDUCER
- FLOAT LEVEL SWITCH
- HUMIDITY SENSOR
- TEMPERATURE SENSOR
- MAGNETIC INTRUSION SENSOR

P&ID INSTRUMENT SYMBOLS

PROGRAMMABLE LOGIC CONTROL	DATA HIGHWAY NETWORK	SHARED DISPLAY, SHARED CONTROL	DISCRETE INSTRUMENTS	
XXX 000	XXX 000	XXX 000	XXX 000	AT CONTROL PANEL (CP) ACCESSIBLE TO OPERATOR
XXX 000	XXX 000		XXX 000	AT VENDOR SUPPLIED PLC/CABINET OR INACCESSIBLE TO OPERATOR
XXX 000	XXX 000	XXX 000	XXX 000	IN FIELD A LOCAL CONTROL PANEL (LCP) ACCESSIBLE TO OPERATOR
XXX 000	XXX 000	XXX 000	XXX 000	AT MCC ACCESSIBLE TO OPERATOR

ACTUATOR SYMBOLS

- E XX — ELECTRIC MOTOR
- MANUAL OR CHAIN WHEEL
- S — SOLENOID

NOTE:
ON LOSS OF PRIMARY POWER (PNEUMATIC OR ELECTRIC)
FO = FAIL OPEN
FC = FAIL CLOSED
FLP = FAIL TO LAST POSITION

PANEL NOMENCLATURE

CP–XXX:	CONTROL PANEL (AREA CONTROL)
LCP–XXXA:	LOCAL CONTROL PANEL (SPECIFICATION PROCESS CONTROL) LETTERS A, B, C DENOTES VENDER SUPPLIED EQUIPMENT
MCC–XX:	MOTOR CONTROL CENTER
LP–X	LIGHTING PANEL (BREAKER PANEL)
PP–X	POWER PANEL (BREAKER PANEL)
PLC–X	PROGRAM LOGIC CONTROLLER

INSTRUMENT IDENTIFICATION LETTERS
(INSTRUMENT SOCIETY OF AMERICA)

	FIRST – LETTER		SUCCEEDING – LETTERS		
	MEASURED OR INITIATING VARIABLE		**READOUT OR PASSIVE FUNCTION**	**OUTPUT FUNCTION**	**MODIFIER**
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL	CLOSED
D	USER'S CHOICE	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		GLASS, VIEWING DEVICE		
H	HAND				HIGH
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW
M	USER'S CHOICE	MOMENTARY			MIDDLE, INTERMEDIATE
N	TORQUE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION		OPEN
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTAL			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

GENERAL NOTES

1. THIS IS A STANDARD LEGEND, THEREFORE NOT ALL OF THIS INFORMATION MAY BE USED ON THIS PROJECT.
2. P & I D INSTRUMENTATION DETAILS DO NOT REPRESENT INSTRUMENTS AND CONTROLS INTEGRAL TO VENDOR SUPPLIED CONTROL PANELS OR EQUIPMENT. SEE EQUIPMENT SPECIFICATIONS FOR THIS INFORMATION.
3. P & I D DOES NOT REPRESENT CONTROL STRATEGIES OR INTERACTIONS. SEE SPECIFICATION SECTION 25 51 00 – INTEGRADED AUTOMATION CONTROL OF FACILITY EQUIPMENT, FOR THIS INFORMATION.

REV.		
DATE	01/08/2025	
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733–2087

DRAWING TITLE: PROCESS & INSTRUMENTATION DIAGRAM (PID) SYMBOLS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES
TOWN OF JACKSON, WY

DRAWING NO: G1.0

JOB NO: 23-302-02

S:\Proj\2023\302-02 toj high school rd water supply facilities\14 drawings\Civil\MSR WMYID-SYMBOLS.dwg (G1.0 PID SYMBOLS) - Apr 09 2025 11:58:42 am PLOTTED BY: green DWG FORMAT: 25D

NOTE:
TEXT AND LINE WORK THAT IS:
FADED = FUTURE
BOLD = THIS PROJECT

SCADA

PLC-100/RTU (1)

SPEED SC 910 | RUNNING YI 910 | FAIL YA 910 | LOC/REM YI 910 | LOW ALARM LAL 912 | LRIC 912

(1) LOCAL CONTROL PANEL/HMI
LCP-910
SPEED SC 910 | VFD-910 | HOA HS 910

LCP LOCATED IN PUMP HOUSE CONTROL ROOM

PT 912
PE 912

PT/PE-912 (1)

AIR VALVE MANHOLE

ARV | CV | HV | 8"ø DIP | 10"ø HDPE

W-900
1450 GPM

TOJ WELL NO. 9

CHEMICAL INJECTION VAULT

10"ø HDPE | 20"ø HDPE

CHLORINE CONTACT CLEARWELL

PG | FM-921 (1) | CV | HV

NOTE: EQUIPMENT LOCATED IN THE PUMP HOUSE CONTROL ROOM

1"ø CHLORINE DISINFECTANT FROM PUMP HOUSE – CHLORINE ROOM SEE SHEET G1.3

3/4"ø PHOSPHATE SOLUTION FROM PUMP HOUSE – CONTROL ROOM SEE SHEET G1.4

PUMP HOUSE – CHLORINE ROOM SEE SHEET G1.3 FROM 3/4"ø CHLORINE DISINFECTANT

PUMP HOUSE – CONTROL ROOM SEE SHEET G1.4 FROM 3/4"ø PHOSPHATE SOLUTION

FC 921 | FQIR 921 | LOW FLOW ALARM FAL 921 | SPEED SC 1010 | RUNNING YI 1010 | FAIL YA 1010 | LOC/REM YI 1010 | LOW ALARM LRIC 1012 | LAL 1012

(1) LOCAL CONTROL PANEL/HMI
LCP-1010
SPEED SC 1010 | VFD-1010 | HOA HS 1010

LCP LOCATED IN PUMP HOUSE CONTROL ROOM

PT 1012
PE 1012

FIT 921
FE 921

PT/PE-1012 (1)

AIR VALVE MANHOLE

ARV | CV | HV | 8"ø DIP

W-1000
1450 GPM

TOJ WELL NO. 10

LOW FLOW ALARM FAL 1021 | FQIR 1021 | FC 1021

FIT 1021
FE 1021

20"ø HDPE

CHLORINE CONTACT CLEARWELL

PG | FM-1021 (1) | CV | HV

10" HDPE SHT G1.2

10" HDPE SHT G1.2

NOTE: EQUIPMENT LOCATED IN THE PUMP HOUSE CONTROL ROOM

8"ø DIP

NOTES

(1) EXCEPT AS NOTED ON THESE SHEETS, AND IN THE PROCESS ("P.X") PLANS, CONTRACTOR SHALL INSTALL OWNER FURNISHED PROCESS AND CONTROL EQUIPMENT. IN COORDINATION WITH CST, INSTALL REQUIRED CONDUITS/RACEWAYS AND PULL ALL LOW VOLTAGE CABLING FROM EQUIPMENT TO THE PLC FOR INTERFACING WITH SCADA. TOJ'S CONTROLS CONTRACTOR, CONTROL SYSTEMS TECHNOLOGY (CST), WILL INSTALL THE PLC PANEL AND LAND ALL LOW VOLTAGE CABLING AT THE PLC; ALL OTHER MATERIAL AND LABOR SHALL BE PROVIDED BY CONTRACTOR.

WELLS

REV.	DATE	SURVEYED	ENGINEERED	DRAWN	CHECKED	APPROVED
	01/08/2025	n/a	JK	BJG/JK		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE: PROCESS & INSTRUMENTATION DIAGRAM (PID) WELLS 9 AND 10

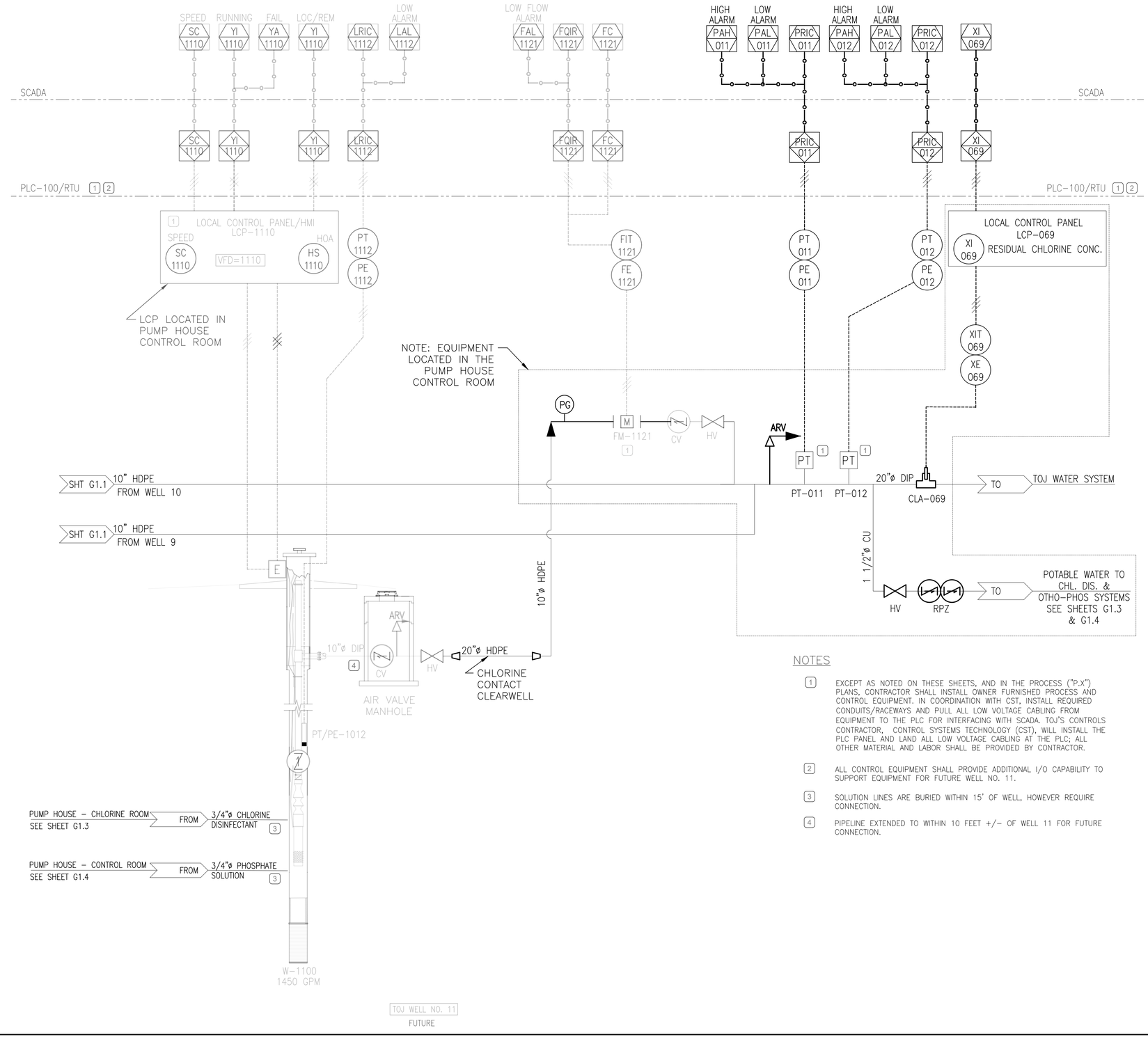
JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: G1.1

JOB NO: 23-302-02

S:\Proj\2023\302-02 (toj high school rd water supply facilities)\4 drawings\Civil\HSR WPH\PID-WELL HOUSE.dwg G1.1 PID-WELLS 9 AND 10 - Apr 16 2025 04:59:32 pm PLOTTED BY klipatrick DWG FORMAT: 25.0

NOTE:
TEXT AND LINE WORK THAT IS:
FADED = FUTURE
BOLD = THIS PROJECT



NOTES

1. EXCEPT AS NOTED ON THESE SHEETS, AND IN THE PROCESS ("P.X") PLANS, CONTRACTOR SHALL INSTALL OWNER FURNISHED PROCESS AND CONTROL EQUIPMENT. IN COORDINATION WITH CST, INSTALL REQUIRED CONDUITS/RACEWAYS AND PULL ALL LOW VOLTAGE CABLING FROM EQUIPMENT TO THE PLC FOR INTERFACING WITH SCADA. TOJ'S CONTROLS CONTRACTOR, CONTROL SYSTEMS TECHNOLOGY (CST), WILL INSTALL THE PLC PANEL AND LAND ALL LOW VOLTAGE CABLING AT THE PLC; ALL OTHER MATERIAL AND LABOR SHALL BE PROVIDED BY CONTRACTOR.
2. ALL CONTROL EQUIPMENT SHALL PROVIDE ADDITIONAL I/O CAPABILITY TO SUPPORT EQUIPMENT FOR FUTURE WELL NO. 11.
3. SOLUTION LINES ARE BURIED WITHIN 15' OF WELL, HOWEVER REQUIRE CONNECTION.
4. PIPELINE EXTENDED TO WITHIN 10 FEET +/- OF WELL 11 FOR FUTURE CONNECTION.

REV.	DATE	SURVEYED	ENGINEERED	DRAWN	CHECKED	APPROVED
	01/08/2025	n/a	JK	BJG/JK		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE
PROCESS & INSTRUMENTATION DIAGRAM (PID)
WELL #11

JOB TITLE
HIGH SCHOOL ROAD (HSR)
WELL AND PUMP HOUSE FACILITIES
TOWN OF JACKSON, WY

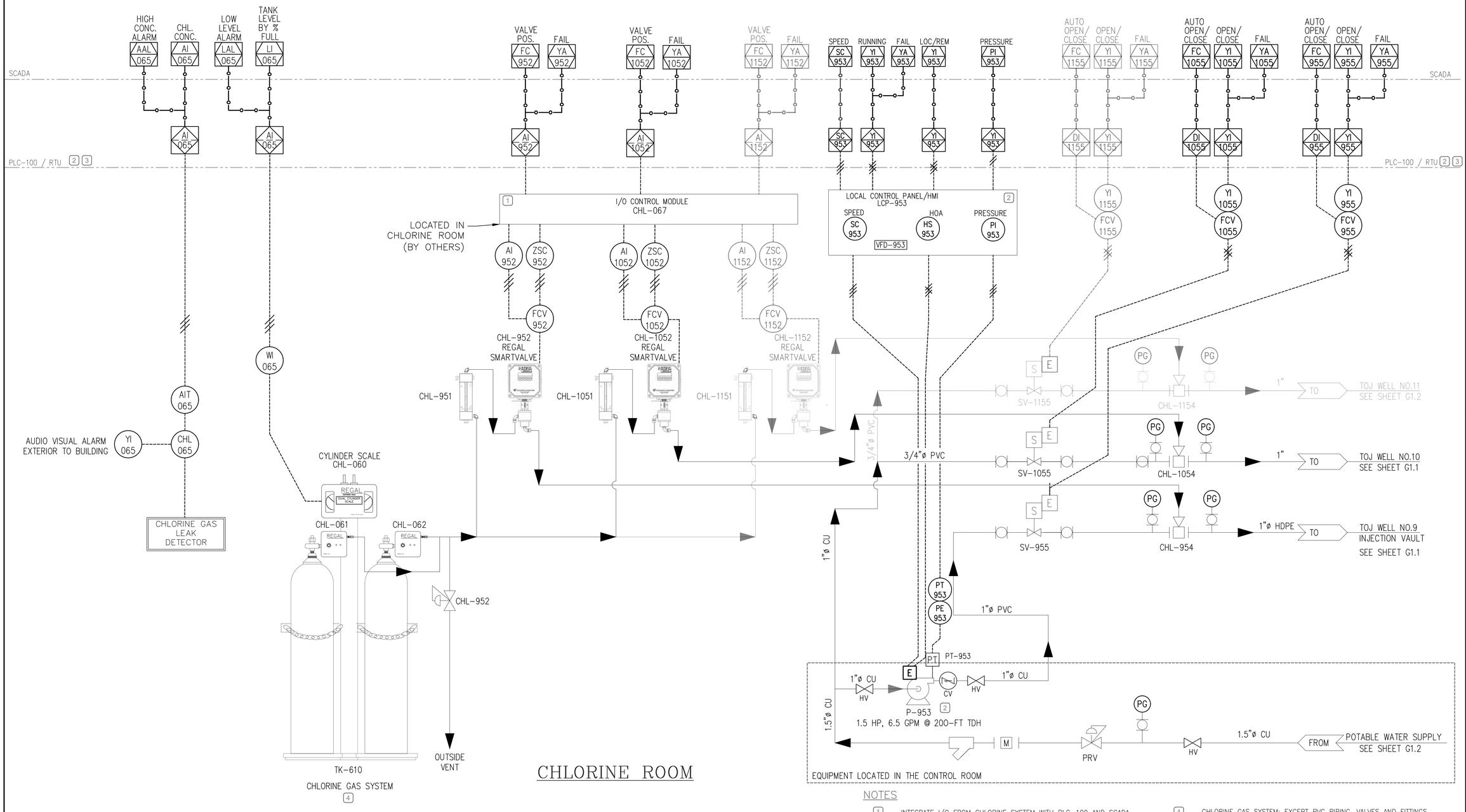
DRAWING NO
G1.2

JOB NO
23-302-02

S:\Proj\2023\302-02 (toj) High school rd water supply facilities\14 drawings\Civil\HSR WH\PID-WELL HOUSE.dwg, G1.2 PID-WELL 11 - Apr 16, 2025 04:58:45 pm PLOTTED BY: kdpatrick DWG FORMAT: 25.0

1 RELOCATE EXISTING AUTOMATIC CONTROL VALVE AND METER.

NOTE:
TEXT AND LINE WORK THAT IS:
FADED = FUTURE
BOLD = THIS PROJECT



CHLORINE ROOM

NOTES

1. INTEGRATE I/O FROM CHLORINE SYSTEM WITH PLC-100 AND SCADA.
2. EXCEPT AS NOTED ON THESE SHEETS, AND IN THE PROCESS ("P.X") PLANS, CONTRACTOR SHALL INSTALL OWNER FURNISHED PROCESS AND CONTROL EQUIPMENT. IN COORDINATION WITH CST, INSTALL REQUIRED CONDUITS/RACEWAYS AND PULL ALL LOW VOLTAGE CABLING FROM EQUIPMENT TO THE PLC FOR INTERFACING WITH SCADA. TOJ'S CONTROLS CONTRACTOR, CONTROL SYSTEMS TECHNOLOGY (CST), WILL INSTALL THE PLC PANEL AND LAND ALL LOW VOLTAGE CABLING AT THE PLC; ALL OTHER MATERIAL AND LABOR SHALL BE PROVIDED BY CONTRACTOR.
3. ALL CONTROL EQUIPMENT SHALL PROVIDE ADDITIONAL I/O CAPABILITY TO SUPPORT EQUIPMENT FOR FUTURE WELL NO. 11.
4. CHLORINE GAS SYSTEM: EXCEPT PVC PIPING, VALVES AND FITTINGS, THE CHLORINE GAS SYSTEM WILL BE FURNISHED AND INSTALLED BY CONTROL SYSTEMS TECHNOLOGY (CST). CST WILL PROVIDE SOLENOID VALVES AND INJECTORS FOR INSTALLATION BY CONTRACTOR. ELECTRICAL CONDUITS AND CABLE FROM THE PLC WILL BE INSTALLED BY CST.

REV.	DATE	01/08/2025
	SURVEYED	n/a
	ENGINEERED	JK
	DRAWN	BJG/JK
	CHECKED	
	APPROVED	

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE
PROCESS & INSTRUMENTATION DIAGRAM (PID)
CHLORINE ROOM

JOB TITLE
HIGH SCHOOL ROAD (HSR)
WELL AND PUMP HOUSE FACILITIES
TOWN OF JACKSON, WY

DRAWING NO G1.3

JOB NO 23-302-02

S:\Proj\2023\302-02 (toj high school rd water supply facilities)\4 drawings\civil\HSR WH\PID_Chlorine.dwg -G1.3 PID-CHLORINATION ROOM- - Apr 09 2025 11:32:57 am PLOTTED BY: grwen DWG FORMAT: 25.0

NOTE:
TEXT AND LINE WORK THAT IS:
FADED = FUTURE
BOLD = THIS PROJECT

SCADA

PLC-100/RTU [1] [2]

SPEED SC 1131 | RUNNING YI 1131 | FAIL YA 1131 | RUN YC 1131 | LOC REM YI 1131

SPEED SC 1031 | RUNNING YI 1031 | FAIL YA 1031 | RUN YC 1031 | LOC REM YI 1031

LOC REM YI 931 | RUN YC 931 | FAIL YA 931 | RUNNING YI 931 | SPEED SC 931

SPEED SC 933 | RUNNING YI 933 | FAIL YA 933 | LOC/REM YI 933 | PRESSURE PI 933

AUTO OPEN/CLOSE FC 1132 | OPEN/CLOSE YI 1132 | FAIL YA 1132

AUTO OPEN/CLOSE FC 1032 | OPEN/CLOSE YI 1032 | FAIL YA 1032

AUTO OPEN/CLOSE FC 932 | OPEN/CLOSE YI 932 | FAIL YA 932

LOCAL CONTROL PANEL LCP-1131 [2]: SPEED SC 1131, HOA HS 1131

LOCAL CONTROL PANEL LCP-1031 [1]: SPEED SC 1031, HOA HS 1031

LOCAL CONTROL PANEL LCP-931 [1]: HOA HS 931, SPEED SC 931

LOCAL CONTROL PANEL/HMI LCP-933 [1]: SPEED SC 933, HOA HS 933, PRESSURE PI 933, VFD-933

YI 1132, FCV 1132

YI 1032, FCV 1032

YI 932, FCV 932

SV-1132 | 3/4"ø HDPE | TO TOJ WELL NO.11 SEE SHEET G1.2

SV-1032 [1] | 3/4"ø HDPE | TO TOJ WELL NO.10 SEE SHEET G1.1

SV-932 [1] | 3/4"ø HDPE | TO TOJ WELL NO.9 INJECTION VAULT SEE SHEET G1.1

PT 933, PE 933, PT-933

FROM POTABLE WATER SEE SHEET G1.2 | 1"ø CU | N.O. | 1"ø GALV. STL | HV | CV | HV

P-933 [1]
0.5 HP, 4 GPM @ 60-FT TDH

500 GAL ORTHO-PHOSPHATE SOLUTION TANK

3/8"ø TUBING → 0-12 GPD P-1131

3/8"ø TUBING → 0-12 GPD P-1031 [1]

3/8"ø TUBING → 0-12 GPD **P-931** [1]

CONTROL ROOM

NOTES

[1] EXCEPT AS NOTED ON THESE SHEETS, AND IN THE PROCESS ("P.X") PLANS, CONTRACTOR SHALL INSTALL OWNER FURNISHED PROCESS AND CONTROL EQUIPMENT. IN COORDINATION WITH CST, INSTALL REQUIRED CONDUITS/RACEWAYS AND PULL ALL LOW VOLTAGE CABLING FROM EQUIPMENT TO THE PLC FOR INTERFACING WITH SCADA. TOJ'S CONTROLS CONTRACTOR, CONTROL SYSTEMS TECHNOLOGY (CST), WILL INSTALL THE PLC PANEL AND LAND ALL LOW VOLTAGE CABLING AT THE PLC; ALL OTHER MATERIAL AND LABOR SHALL BE PROVIDED BY CONTRACTOR.

[2] ALL CONTROL EQUIPMENT SHALL PROVIDE ADDITIONAL I/O CAPABILITY TO SUPPORT EQUIPMENT FOR FUTURE WELL NO. 11.

REV.	DATE	SURVEYED	ENGINEERED	DRAWN	CHECKED	APPROVED
	01/08/2025	n/a	JK	BJG/JK		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

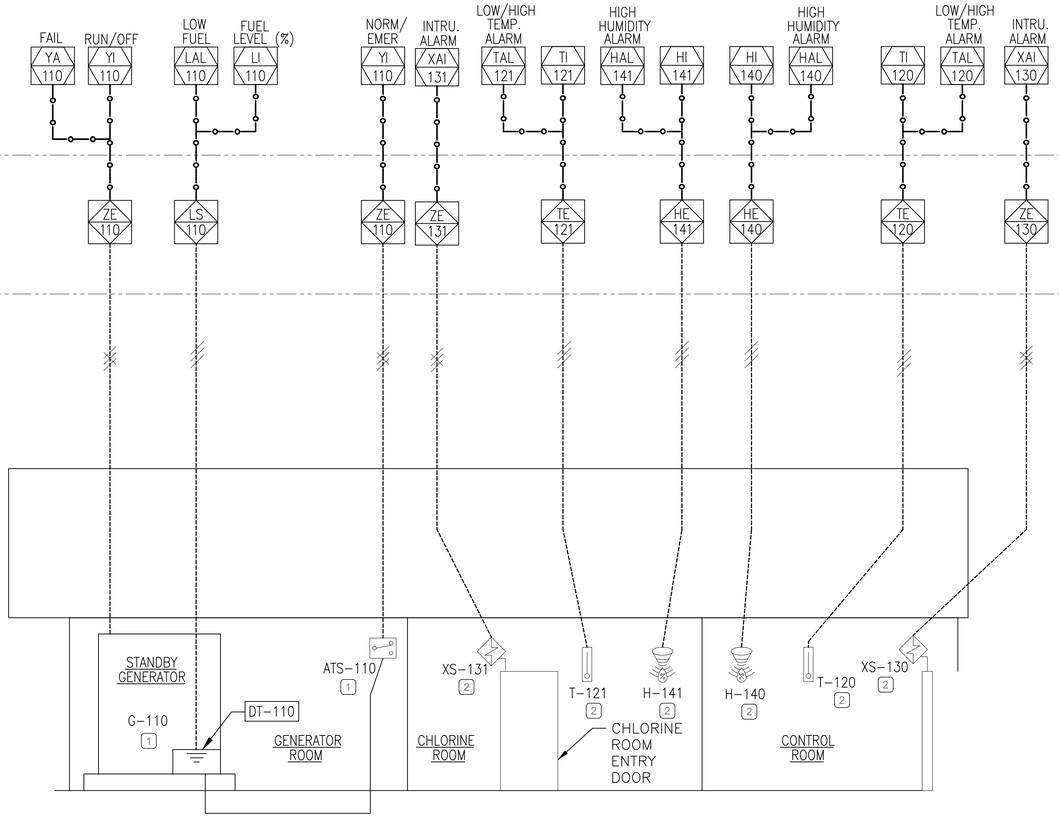
DRAWING TITLE: PROCESS & INSTRUMENTATION DIAGRAM (PID)
IRON & MANGANESE TREATMENT SYSTEM

JOB TITLE: HIGH SCHOOL ROAD (HSR)
WELL AND PUMP HOUSE FACILITIES
TOWN OF JACKSON, WY

DRAWING NO: G1.4
JOB NO: 23-302-02

12/18/18 13:37 GREEN R23 S:\PRO\2013\248-01 (ADDRESS CRITICAL MOOSE WATER SYSTEM)\GRTE\14967\DD - REPLACE MOOSE WATER SYS\DRAWINGS\GENERAL\G5.3-PID.DWG XREFS: ..\BASES\XG-TITLBLK.DWG;

NOTE:
TEXT AND LINE WORK THAT IS:
FADED = FUTURE
BOLD = THIS PROJECT



PUMP HOUSE BUILDING

NOTES

1. EXCEPT AS NOTED ON THESE SHEETS, AND IN THE PROCESS ("P.X") PLANS, CONTRACTOR SHALL INSTALL OWNER FURNISHED PROCESS AND CONTROL EQUIPMENT. IN COORDINATION WITH CST, INSTALL REQUIRED CONDUITS/RACEWAYS AND PULL ALL LOW VOLTAGE CABLING FROM EQUIPMENT TO THE PLC FOR INTERFACING WITH SCADA. TOJ'S CONTROLS CONTRACTOR, CONTROL SYSTEMS TECHNOLOGY (CST), WILL INSTALL THE PLC PANEL AND LAND ALL LOW VOLTAGE CABLING AT THE PLC; ALL OTHER MATERIAL AND LABOR SHALL BE PROVIDED BY CONTRACTOR.

2. HUMIDITY, TEMPERATURE AND MAGNET DOOR INTRUSION SENSORS SHALL BE FURNISHED AND INSTALLED BY OWNER'S CONTROLS CONSULTANT, CONTROL SYSTEMS TECHNOLOGY (CST). WORK COMPLETED BY CST INCLUDES ALL ELECTRICAL CONDUITS AND CABLE TO THE PLC.

REV.	DATE	SURVEYED	ENGINEERED	DRAWN	CHECKED	APPROVED
	01/08/2025	n/a	JK	BJG/JK		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

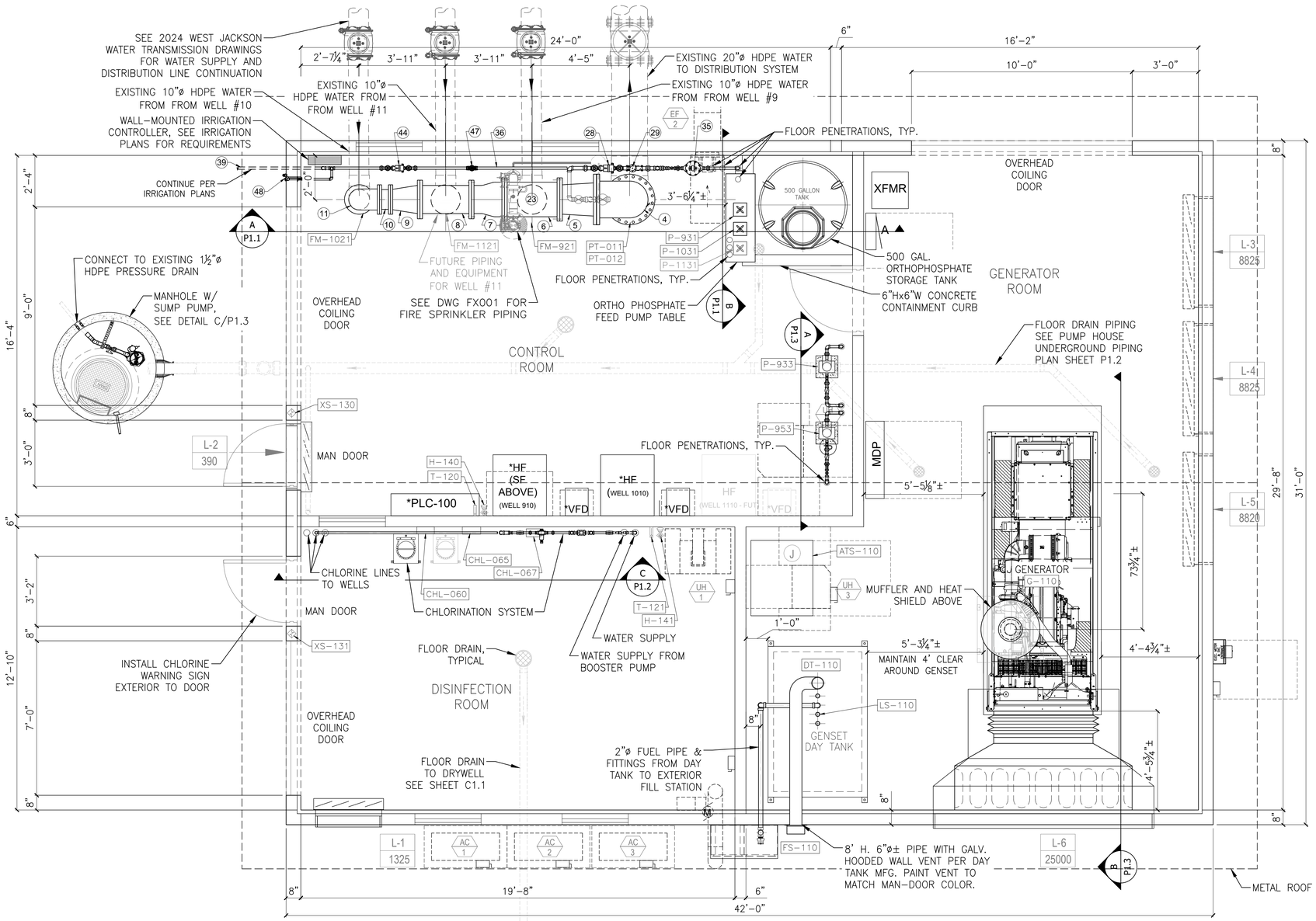
DRAWING TITLE
PROCESS & INSTRUMENTATION DIAGRAM (PID)
PUMP HOUSE

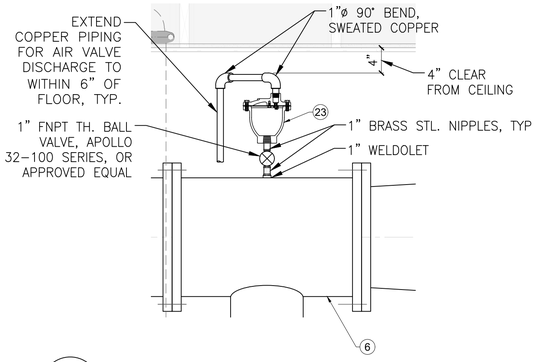
JOB TITLE
HIGH SCHOOL ROAD (HSR)
WELL AND PUMP HOUSE FACILITIES
TOWN OF JACKSON, WY

DRAWING NO
G1.5

JOB NO
23-302-02

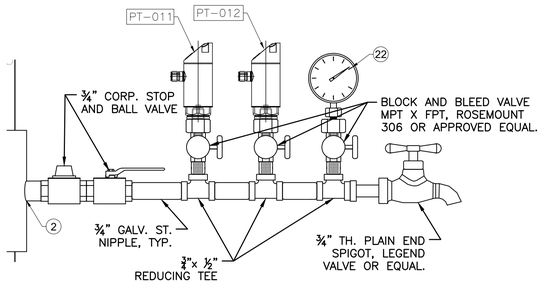
12/18/18 13:37 GREEN R23 S:\PROJ2013\248-01 (ADDRESS CRITICAL MOOSE WATER SYSTEM)\GRTE\149677\DD - REPLACE MOOSE WATER SYS\DRAWINGS\GENERAL\G5.3-PID.DWG XREFS: ..\BASES\XG-TITLBLK.DWG;





1 P1.0 **AIR VALVE DETAIL**

Scale: N.T.S.



NOTES:
1. COMPLY WITH PROCESS AND CONTROL NOTES, THIS SHEET.
2. PIPE, PIPE FITTINGS AND VALVES MUST BE DESIGNED TO MEET SERVICE PRESSURES AT EACH LOCATION.
3. INSTALLATION ACCESSORIES (VALVES/SNUBBERS) ARE REQUIRED FOR EACH PRESSURE TRANSDUCER.
4. ALL VALVES, FITTINGS, AND EQUIPMENT SHALL BE BRASS OR STAINLESS STEEL.
5. PROVIDE BUSHINGS WHERE REQUIRED FOR INSTALLATION OF EQUIPMENT
6. COORDINATE INSTALLATION AND CALIBRATION WITH THE CONTROLS CONTRACTOR.

2 P1.0 **PRESSURE TRANSDUCER DETAIL**

Scale: N.T.S.

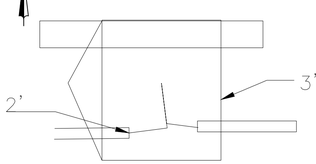
GENERAL PROCESS AND CONTROL NOTES:

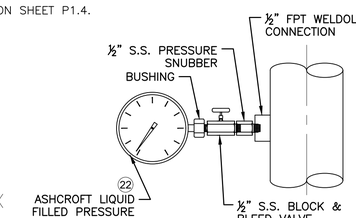
1. EXCEPT AS NOTED ON THESE SHEETS, AND IN THE PROCESS ("P.X") PLANS, CONTRACTOR SHALL INSTALL OWNER FURNISHED PROCESS AND CONTROL EQUIPMENT. IN COORDINATION WITH CST, INSTALL REQUIRED CONDUITS/RACEWAYS AND PULL ALL LOW VOLTAGE CABLING FROM EQUIPMENT TO THE PLC FOR INTERFACING WITH SCADA. TOJ'S CONTROLS CONTRACTOR, CONTROL SYSTEMS TECHNOLOGY (CST), WILL INSTALL THE PLC PANEL AND LAND ALL LOW VOLTAGE CABLING AT THE PLC; ALL OTHER MATERIAL AND LABOR SHALL BE PROVIDED BY CONTRACTOR. COMPLY WITH NOTES BELOW AND THOSE PROVIDED ON G1.0-G1.5.
2. EQUIPMENT CALLED FOR TO BE FURNISHED BY OWNER (*) SHALL BE PROVIDED BY ToJ's CONTROLS CONTRACTOR, CONTROLS SYSTEMS TECHNOLOGY (CST). WORK SHALL COMPLY WITH NOTE 1 ABOVE.
3. EQUIPMENT CALLED FOR TO BE FURNISHED AND INSTALLED BY OWNER (**) SHALL BE PROVIDED AND INSTALLED BY ToJ's CONTROLS CONTRACTOR, CONTROLS SYSTEMS TECHNOLOGY (CST). CONTRACTOR SHALL COORDINATED INSTALLATION OF THIS EQUIPMENT WITH ENGINEERING AND CST.
4. CONTRACTOR SHALL VERIFY ACTUAL QUANTITY OF FITTINGS BASED ON PLANS AND INSTALLATION CONSTRAINTS. ALL DRAINAGE AND CARRIER CONDUITS SHALL BE INSTALLED WITH "LONG" SWEEP FITTINGS AND BENDS.
5. ALL PIPE HANGERS, SUPPORTS AND ASSOCIATED HARDWARE SHALL BE STAINLESS STEEL. INSTALL ACCORDING TO SPACING REQUIREMENTS IN SPECIFICATION 22 05 29.
6. PROVIDE DIELECTRIC INSULATION BETWEEN COPPER ALLOY AND FERROUS MATERIALS.
7. LABEL PIPING AND EQUIPMENT IN ACCORDANCE WITH SECTION 40 05 53.
8. ALL CHLORINE GAS EQUIPMENT SHALL BE MANUFACTURED BY REGAL.
9. ALL DI PIPING, FITTINGS AND APPURTENANCES SHALL BE SHOP PRIMED AND FIELD COATED WITH 2-COATS OF TENEMEC SERIES N69, 3-5 MILS/ PER COAT, OR APPROVED EQUAL APPLY PER MFG RECOMMENDATIONS.

* PRESSURE TRANSDUCER LOCATED AT WELLS. SEE DETAILS ON SHEET P1.4.

PUMP HOUSE PROCESS PLAN

SCALE: 3/16"=1'-0" (11x17)

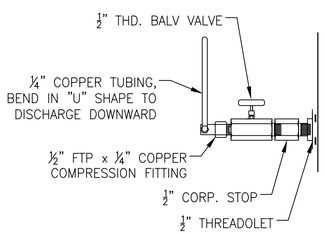




NOTES:
1. INSTALL ALL PRESSURE GAUGES WITH BLOCK AND BLEED VALVE AND PRESSURE SNUBBER.
2. ALL VALVES, FITTINGS, AND EQUIPMENT SHALL BE BRASS OR STAINLESS STEEL.

3 P1.0 **PRESSURE GAUGE DETAIL**

Scale: N.T.S.



4 P1.0 **SAMPLING CONNECTION**

Scale: N.T.S.

DATE	01/08/2025	REV.
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BKG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

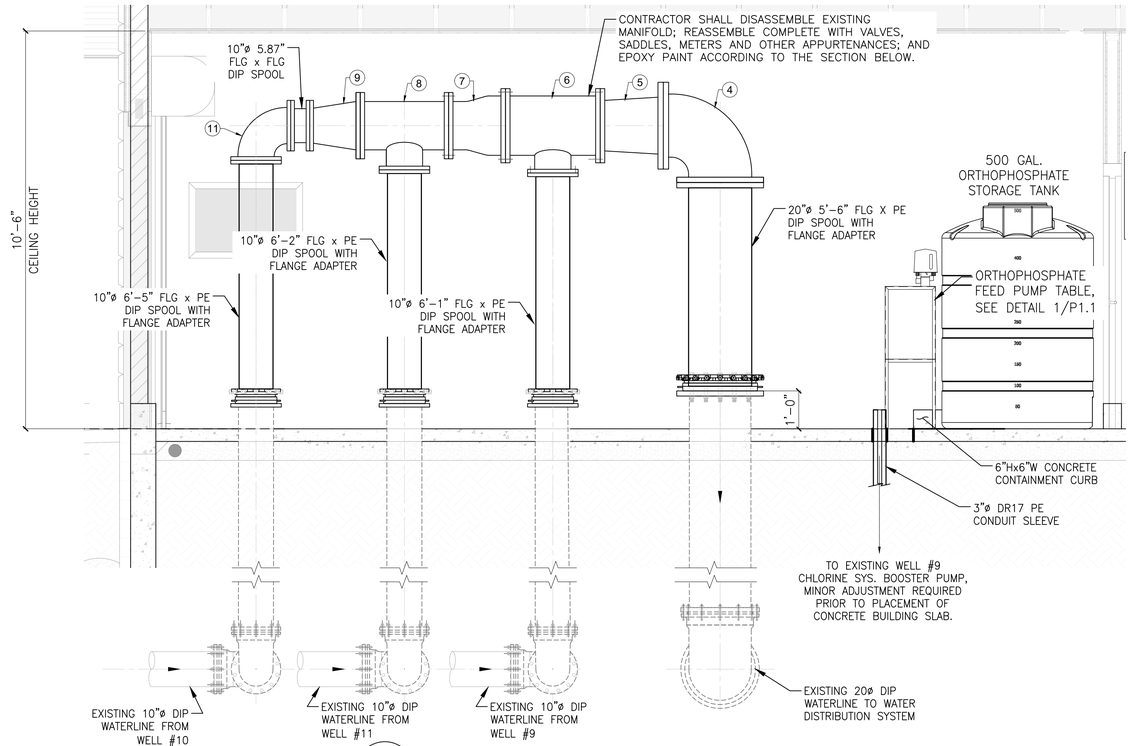
DRAWING TITLE: PUMP HOUSE PROCESS PLAN

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: P1.0

JOB NO: 23-302-02

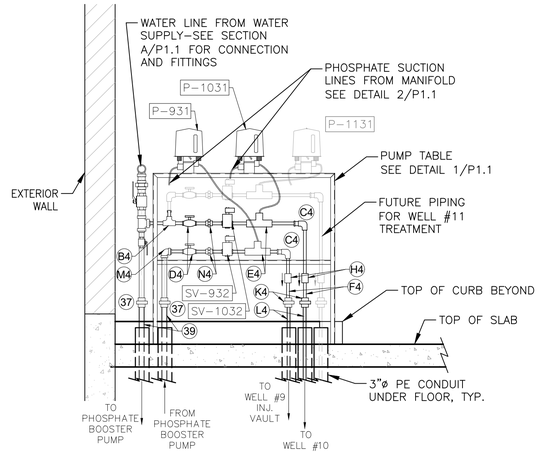
S:\Proj\2023\302-02 (tsj) high school rd water supply facilities\14 drawings\Civil\SR WtrWell HOUSE PROCESS PLANS.dwg 0710 PUMP HOUSE PROCESS PLAN - Aug 28 2025 9:46:23 am PLOTTED BY: bkgarrick DWG FORMAT: D53



A1 / P1.1 **EXISTING WELL PIPING MANIFOLD**

Scale: 1/4" = 1'-0" (11x17)

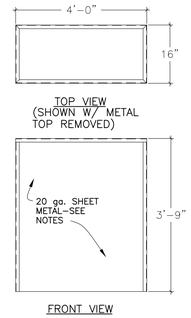
0 24 48



NOTE: ALL PIPE AND EQUIPMENT TO BE SUPPORTED ON SHEET METAL BACKING.

B / P1.1 **ORTHOPHOSPHATE SYSTEM DETAIL**

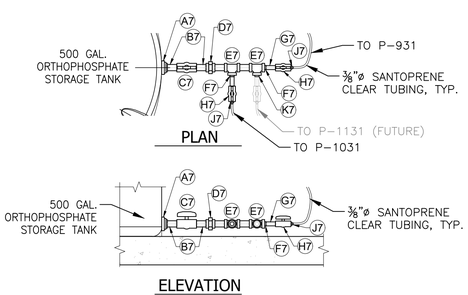
Scale: N.T.S.



NOTES:
1. ALL FRAME TO BE CONSTRUCTED OF 1-1/8"x1-1/8"x1/8" ANGLE A36 STEEL.
2. ALL JOINTS TO BE 1/8" WELD- EITHER FILLET OR BUTT TYPE, WHICHEVER APPLIES.
3. STAND TO BE PRIMED & PAINTED W/ GRAY ENAMEL, COLOR SELECTED BY OWNER

1 / P1.1 **ORTHOPHOSPHATE PUMP TABLE DETAIL**

Scale: N.T.S.



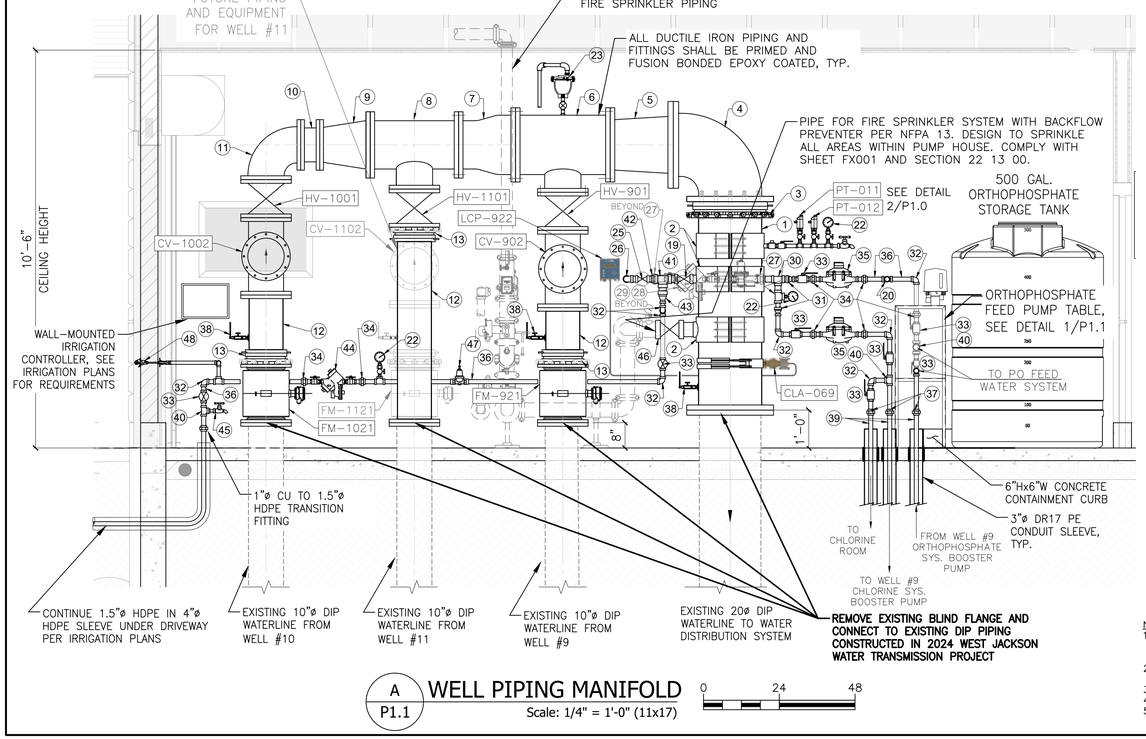
2 / P1.1 **ORTHOPHOSPHATE STORAGE TANK FEED MANIFOLD DETAIL**

Scale: N.T.S.

PIPE & EQUIPMENT SCHEDULE

MARK	SIZE	QUANTITY	DESCRIPTION	SPEC SECTION
WELL MANIFOLD / WATER SUPPLY				
HV-901	HV-1001 HV-1101	3	10"ø FLG GATE VALVE, RESILIENT SEATED NRS WITH HAND-WHEEL, AWWA C509-94	40 05 23.15
CV-902 CV-1002	10"ø	2	FLG CHECK VALVE, MUELLER A-3600 SWING TYPE W/ LEVER AND WEIGHT, AWWA C508	40 05 23.24
FM-921	FM-1021	2	* 10"ø FLG MAG METER, McCROMETER ULTRA MAG W/ PROCOMM CONVERTER	25 30 00
PT-011	PT-012	2	* PRESSURE SENSOR, 0-200 PSI RANGE (MIN.), IFM PN2293, SEE DETAIL 2/P1.0	25 30 00
1	20"ø	1	DI PIPE SPOOL, FLG x PE	40 05 13.53
2	20"ø	3	TAPPING SADDLE, SEE PLANS FOR OUTLET SIZE	40 05 13
3	20"ø	1	RESTRAINED FLANGE COUPLING ADAPTER	40 05 13
4	20"ø	1	90° BEND, FLG x FLG	40 05 13.53
5	20"x16"	1	DI REDUCER, FLG x FLG	40 05 13.53
6	16"x10"	1	DI REDUCING TEE, FLG x FLG	40 05 13.53
7	16"x14"	1	DI REDUCER, FLG x FLG	40 05 13.53
8	14"x10"	1	DI REDUCING TEE, FLG x FLG	40 05 13.53
9	14"x10"	1	DI REDUCER, FLG x FLG	40 05 13.53
10	10"ø	1	DI PIPE SPOOL, FLG x FLG	40 05 13.53
11	10"ø	1	90° BEND, FLG x FLG	40 05 13.53
12	10"ø	3	DI PIPE, PE x FLG	40 05 13.53
13	10"ø	3	RESTRAINED FLANGE COUPLING ADAPTER	40 05 13
19	2"ø	1	CORP STOP	33 12 13
20	3/4"ø	1	TEE WITH THREADED W/ HOSE BIB	33 12 13 AND 22 11 19
22		3	PRESSURE GAUGE, SEE DETAIL 3/P1.0	22 11 19
23	1"ø	1	VALMATIC AIR RELEASE VALVE MODEL 22.3 W/ 3/32" ORIFICE, SEE DETAIL 1/P1.0	40 05 13
24	1-1/2"ø		SWEATED COPPER PIPE PE x PE	22 11 16
25	1-1/2"ø	1	ISOLATION VALVE	33 12 13
26	1-1/2"ø	2	90° BEND SWEATED COPPER	22 11 16
27	1-1/2"ø	2	COPPER UNION	22 11 16
28	1-1/2"ø	1	REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER ZURN 975XL OR EQUAL	22 11 19
29	1-1/2"ø	1	PRESSURE REDUCING VALVE WITH STRAINER, WATTS LF25AUB-Z3-HP, OR EQUAL	22 11 19
30	1-1/2"ø	2	TEE SWEATED COPPER	22 11 16
31	1-1/2"x1"	2	REDUCER SWEATED COPPER	22 11 16
32	1"ø	8	90° BEND SWEATED COPPER	22 11 16
33	1"ø	8	BALL VALVE BRASS/BRONZE	22 05 23
34	1"ø	7	UNION BRASS/BRONZE	22 11 16
35	1"	2	FLOW METER, NEPTUNE MACH 10 W/ FLOW RATE INDICATOR OR EQUAL	22 11 19
36	1"ø		SWEATED COPPER PIPE PE x PE	22 11 16
37	1"ø	4	COPPER HDPE TRANSITION FITTING	22 11 16
38	3/4"ø	3	SAMPLING PORT, SEE DETAIL 4/P1.0	22 11 16
39	1"ø	–	HDPE PIPE (IPS) DR11 PE4710, 200 PSI	22 11 16
40	1"ø	3	TEE SWEATED COPPER	22 11 16
41	2"ø	1	TEE SWEATED COPPER	22 11 16
42	2"x1-1/2"	1	REDUCER SWEATED COPPER	22 11 16
43	2"x1"	1	REDUCER SWEATED COPPER	22 11 16
44	1"ø	1	REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER ZURN 975XL OR EQUAL	22 11 19
45	3/4"ø	1	THREADED SPIGOT FOR IRRIGATION SYSTEM	22 11 19
46	4"ø	1	ISOLATION VALVE FOR FIRE SPRINKLER SYSTEM CONNECTION	33 12 13
47	1"ø	1	WILKINS DOUBLE UNION PRESSSURE REDUCING VALVE OR EQUAL	22 11 19
48	3/4"ø	1	WOODFORD MODEL 65 FREEZLESS ANTI-SIPHON WALL HYDRANT OR EQUAL	22 11 19
ORTHOPHOSPHATE SYSTEM				
P-931	P-1031	2	* PERISTALTIC PUMP, (12 GPD, 150 PSI) PULSATRON, MODEL LMB3TA , OR EQUAL	46 33 44
P-933	3/4 HP	1	VERTICAL TURBINE BOOSTER PUMP (6.5 GPM @ 110-FT TDH), GRUNDFOS CRE 1-6 WITH INTEGRAL VFD, OR EQUAL, SEE DETAIL A/P1.3	43 21 13
B4	3/4 "ø	1	PVC TEE, SCH 80 PVC, THREADED	22 11 16
C4	3/4 "ø	2	90° BEND, SCH 80 PVC, THREADED	22 11 16
D4	3/4 "ø	2	BALL VALVE	40 05 23.12
E4	3/4 "ø	2	INJECTION TEE, 3/4" PVC W/ 3/8"ø TUBE ADAPTER	22 11 16
F4	3/4 "ø	–	SCH 80 PVC PIPE	22 11 16
SV-932	SV-1032	2	3/4" SOLENOID VALVE, NORMALLY OPEN, PLAST-O-MATIC ZC SERIES WITH CAFE-N ELECTRONIC ACTUATOR	40 05 23.72
H4	3/4 "ø	2	PVC CHECK BALL VALVE COMBO	40 05 23.24
K4	3/4 "ø	2	TRANSITION COUPLING, 3/4" PE x 3/4" PVC	22 11 16
L4	3/4 "ø	–	HDPE PIPE (IPS) DR11 PE4710, 200 PSI	22 11 16
M4	1 "ø	1	90° BEND, SCH 80 PVC, THREADED, WITH 3/4" REDUCING BUSHING	22 11 16
N4	3/4 "ø	3	UNION, PVC	22 11 16
ORTHOPHOSPHATE FEED MANIFOLD				
A7	2"ø	1	PVC BULKHEAD FITTING WITH 2"x1-1/2" AND 1-1/2"x1" BUSHINGS	22 11 16
B7	1"ø	–	PIPE, SCH 40 PVC, THREADED	22 11 16
C7	1"ø	1	PVC BALL VALVE	40 05 23.12
D7	1"ø	1	PVC UNION	22 11 16
E7	1"ø	2	PVC TEE	22 11 16
F7	1"x1/2"	2	BUSHING	22 11 16
G7	1/2"ø	–	PIPE, SCH 40 PVC, THREADED	22 11 16
H7	1/2"ø	2	PVC BALL VALVE	40 05 23.12
J7	1/2"x3/8"	2	PLASTIC, QUICK CONNECT ADAPTER FOR 3/8" PE TUBING	22 11 16
K7	1/2"	1	PLUG FOR FUTURE WELL 11 CONNECTION	22 11 16
CHLORINE SYSTEM				
CHL-061	CHL-062	2	** SWITCHOVER GAS CHLORINATOR	46 31 11
CHL-952	CHL-1052	2	** SMART VALVE, REGAL 7001-25 PPD	46 31 11
CHL-063	–	1	** PRESSURE RELIEF VALVE	46 31 11
CHL-954	CHL-1054	2	** EJECTOR, REGAL 25 PPD, WITH NO. 3A NOZZLE	46 31 11
CHL-060	–	1	** DUAL CYLINDER SCALE, REGAL ECS402 - 2 WEIGHT SCALES PROVIDED	46 31 11
CHL-065		1	** CHLORINE GAS LEAK DETECTOR, REGAL 3000 - SEE NOTE 4, DETAIL C/P1.1	46 31 11
CHL-951	CHL-1051	2	** METER ASSEMBLY, REGAL 7500	46 31 11
CHL-067	–	1	** I/O CONTROL MODULE	40 94 33
CLA-069		1	** CHLORINE ANALYZER, INCLUDING HALOGEN 4-20mA MP5 DISPLAY (LCP-069) AND MP5 SENSOR, COMPLETE WITH 2" TAPPING SADDLE, VALVE, AND REQUIRED ACCESSORIES	40 94 33
SV-955	SV-1055	2	* 3/4 " & 1" SOLENOID VALVE, SAME MAKE AS SV-932 ABOVE	40 05 23.72
P-953	1-1/2 HP	1	VERTICAL TURBINE BOOSTER PUMP (6.5 GPM @ 250-FT TDH), GRUNDFOS CRE 1-13 WITH INTEGRAL VFD, OR EQUAL, SEE DETAIL A/P1.3	43 21 13
A2	3/4"ø	–	PIPE, SCH 80 PVC, THREADED	40 05 13.73
B2	3/4"ø	2	PVC BALL VALVE	40 05 23.12
C2	3/4"ø	2	UNION, SCH 80 PVC	40 05 13.73
D2	3/4"x 1/4"	2	TEE W/ PRESSURE GAUGE, SEE DETAIL 3/P1.0	22 11 19
E2	3/4"ø	4	90° BEND, SCH 80 PVC, THREADED	40 05 13.73
F2	3/4"ø x 1/2"ø	1	VACUUM BREAKER - TEE, W/ 1/2" BALL CHECK VALVE, ANTI SYPHON	22 11 19
G2	3/4"ø	1	TRANSITION COUPLING, 3/4" PE x 3/4" PVC	22 11 16
H2	3/4"ø	–	FLEXIBLE PIPE, PE 4710 DR9 (250 PSI)	40 05 13.73
I2	1"x3/4"	1	REDUCER, SCH 80 PVC	22 11 16
J2	1"x3/4"	1	REDUCING TEE, SCH 80 PVC	22 11 16
K2	3/4"	1	CAP FOR FUTURE WELL #11 CONNECTION	22 11 16
M2	1"ø	5	TRANSITION COUPLING, PE x PVC	22 11 16
N2	1"ø	–	PIPE, SCH 80 PVC, THREADED	40 05 13.73
O2	1"ø	1	TRANSITION COUPLING, 1" PE x 1" PVC	22 11 16
P2	1"ø	4	PVC BALL VALVE	40 05 23.12
Q2	1-1/4"ø	1	UNION, PVC	22 11 16
R2	1"ø	8	90° BEND, SCH 80 PVC	22 11 16
S2	1"ø x 1/2"ø	1	VACUUM BREAKER - TEE, W/ 1/2" BALL CHECK VALVE, ANTI SYPHON	22 11 19
U2	1"x 1/4"	2	TEE W/ PRESSURE GAUGE, SEE DETAIL 3/P1.0	22 11 19
GENERATOR SYSTEM				
G-110	–	1	500 KW CUMMINS MODEL 500DFEK DIESEL GENERATOR, OR EQUAL	26 32 13
ATS-110	–	1	CUMMINS AUTOMATIC TRANSFER SWITCH, OR EQUAL	26 32 13
DT-110	–	1	PRYCO STANDARD DOUBLE WALL DAY TANK (560 GAL.) MODEL PY700DW, OR EQUAL. VENT TANK TO THE BUILDING EXTERIOR AS REQUIRED BY MFG.	26 32 13
FS-110	–	1	PRYCO MODEL 230 REMOTE FILL STATION COMPLETE WITH CONTROL PANEL (FUEL LEVEL ALARM) AND FUELING COMPARTMENTS, OR EQUAL	26 32 13
LS-110	–	1	DAY TANK FUEL LEVEL SENSOR BY DAY TANK FG.	26 32 13
T-120	T-121	2	** TEMPERATURE SENSORS	25 30 00
XS-130	XS-131	2	** MAGNETIC DOOR INTRUSION SENSORS	25 30 00
H-140	H-141	2	** HUMIDITY SENSORS	25 30 00

* OR ** - SEE NOTES ON SHEET P1.0



A / P1.1 **WELL PIPING MANIFOLD**

Scale: 1/4" = 1'-0" (11x17)

0 24 48

NOTES:
1. CONTRACTOR SHALL VERIFY ACTUAL QUANTITY OF FITTINGS BASED ON PLANS AND INSTALLATION CONSTRAINTS. ALL DRAINAGE AND CARRIER CONDUITS SHALL BE INSTALLED WITH "LONG" SWEEP FITTINGS AND BENDS.
2. ALL PIPE HANGERS, SUPPORTS AND ASSOCIATED HARDWARE SHALL BE STAINLESS STEEL IN ACCORDANCE WITH SPECIFICATION 22 05 29.
3. PROVIDE DIELECTRIC INSULATION BETWEEN COPPER ALLOY AND FERROUS MATERIALS.
4. LABEL PIPING AND EQUIPMENT IN ACCORDANCE WITH SECTION 40 05 53.
5. ALL CHLORINE GAS EQUIPMENT SHALL BE MANUFACTURED BY REGAL

DATE	01/08/2025	REV.
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BKG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

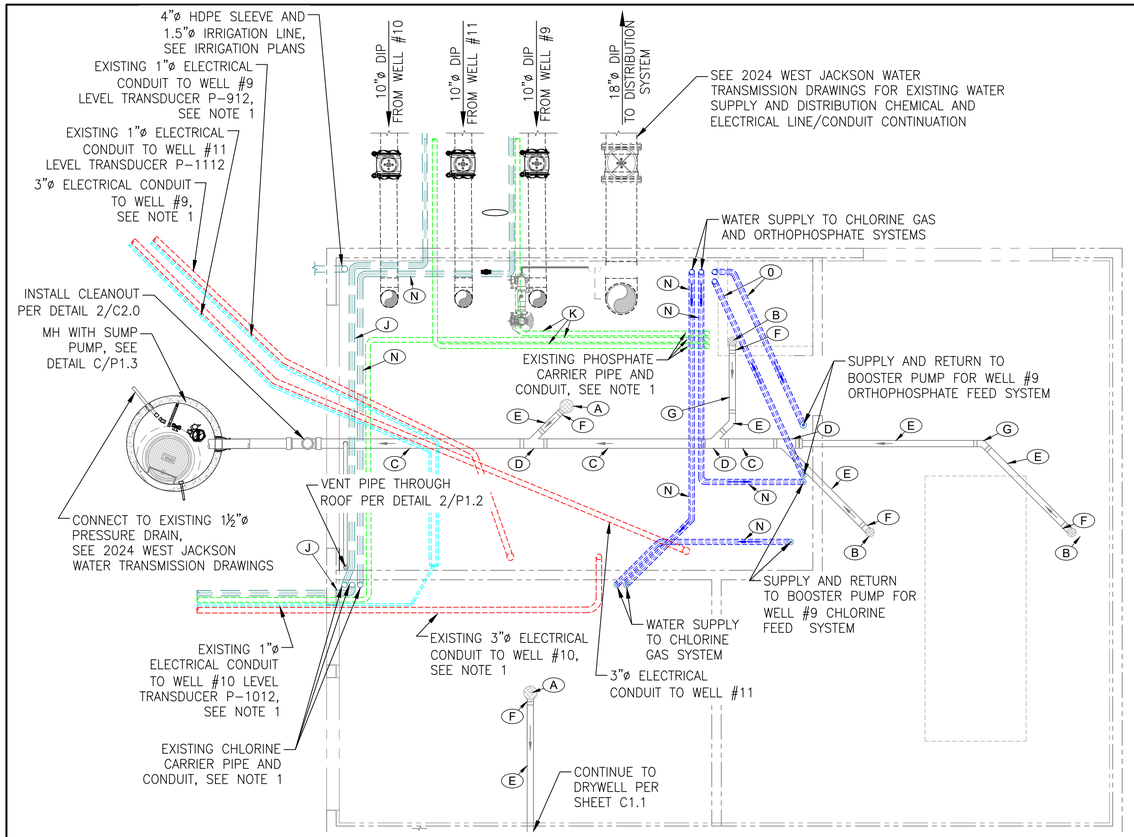
DRAWING TITLE: **PUMP HOUSE PROCESS DETAILS**

JOB TITLE: **HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES**
TOWN OF JACKSON, WY

DRAWING NO: **P1.1**

JOB NO: **23-302-02**

S:\Proj\2023\302-02 (tcj high school rd water supply facilities)\cd drawings\Civil\WSR WELL HOUSE PROCESS FLANG.dwg dhaw HOUSE PROCESS DETAILS - Aug 28 2025 0440:26 am PLOTTED BY kdpatrick DWG FORMAT: 25D



NOTES:
1. PLAN INDICATES BELOW SLAB CONDUIT AND PIPE REQUIREMENTS. NOT ALL ELECTRICAL CONDUITS ARE SHOWN. SEE ELECTRICAL PLANS FOR COORDINATION OF ADDITIONAL BELOW SLAB CONDUITS FOR ELECTRICAL EQUIPMENT.
2. SLOPE DRAIN PIPE AT 2% (MIN.). PROVIDE PIPE BEDDING FOR ALL BURIED PIPE.
3. SLOPE CONCRETE SLABS AT 1% MIN./2% MAX. TO ALL DRAIN LOCATIONS.
4. THE FOLLOWING CONDUITS AND PIPE WILL BE STUBBED UP AT APPROXIMATE LOCATIONS SHOWN IN PLAN ABOVE UNDER THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT. ALL OTHER CONDUITS SHALL BE INSTALLED BY CONTRACTOR UNDER THIS PROJECT.
   - 4.1. POWER CONDUITS AT EACH VFD FOR EACH WELL, INCLUDING FUTURE WELL #11.
   - 4.2. CHLORINE SOLUTION LINES FOR EACH WELL (3 EA.) NEAR THE CHLORINE ENTRY DOOR.
   - 4.3. COMMUNICATION CONDUIT FOR WELL WATER LEVEL PRESSURE TRANSDUCERS (3 EA.) AT THE PLC.
5. CONDUITS DESCRIBED AS "EXISTING" HAVE BEEN INSTALLED AND STUBBED UP AT LOCATIONS PER THIS PLAN. MINOR ADJUSTMENTS IN FINAL LOCATION MAY BE REQUIRED DEPENDING ON FINAL LAYOUT OF EQUIPMENT. CONTRACTOR SHALL VERIFY FINAL LOCATIONS WITH EQUIPMENT SUPPLIERS AND ENGINEER.

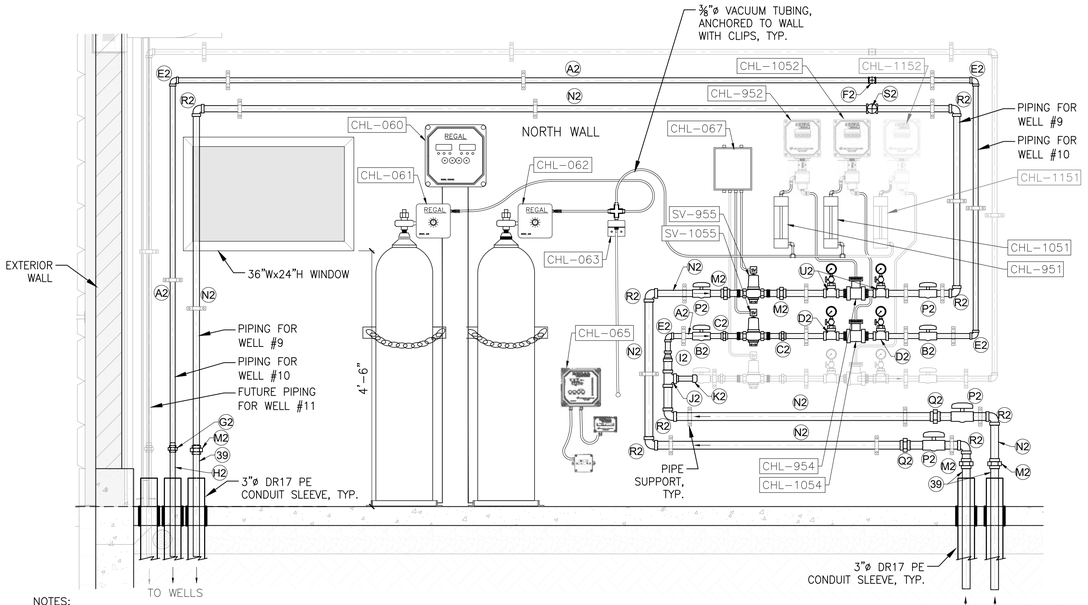
PUMP HOUSE UNDERGROUND PIPING PLAN

SCALE: 1/8" = 1'-0" (11x17)

PUMP HOUSE UNDERGROUND DRAIN PIPE, CONDUIT & FITTING SCHEDULE

ITEM	QTY	DESCRIPTION	SPEC. SECTION
(A)	2	9"ø FLOOR DRAIN W/P-TRAP, ZURN Z520 W/ 4"ø OUTLET AND SURESEAL FLOOR DRAIN TRAP SEALER, OR EQUAL	22 13 19
(B)	3	6"ø FLOOR DRAIN W/P-TRAP, ZURN FD-2340 W/ 4"ø OUTLET AND SURESEAL FLOOR DRAIN TRAP SEALER, OR EQUAL	22 13 19
(C)	–	6"ø PIPE, SCH 40 PVC, SLIP FIT, LENGTH AS REQ'D	22 13 16
(D)	3	6"x6"x4" SWEEP WYE, SCH 40 PVC, SLIP FIT	22 13 16
(E)	–	4"ø PIPE, SCH 40 PVC, SLIP FIT, LENGTH AS REQ'D	22 13 16
(F)	5	4"ø 90° BEND, SCH 40 PVC, SLIP FIT	22 13 16
(G)	2	4"ø 45° BEND, SCH 40 PVC, SLIP FIT	22 13 16
(J)	–	3"ø DR17 PE CONDUIT, W/ LONG SWEEP BENDS, LENGTH AS REQ'D (FOR ¾"ø CHLORINE LINES)	22 13 16
(K)	–	3"ø DR17 PE CONDUIT, W/ LONG SWEEP BENDS, LENGTH AS REQ'D (FOR ¾"ø ORTHOPHOSPHATE LINES)	22 13 16
(N)	–	3"ø DR17 PE CONDUIT, W/ LONG SWEEP BENDS, LENGTH AS REQ'D (FOR 1"ø CHLORINE LINES)	22 13 16
(O)	–	3"ø DR17 PE CONDUIT, W/ LONG SWEEP BENDS, LENGTH AS REQ'D (FOR 1"ø ORTHOPHOSPHATE LINES)	22 13 16

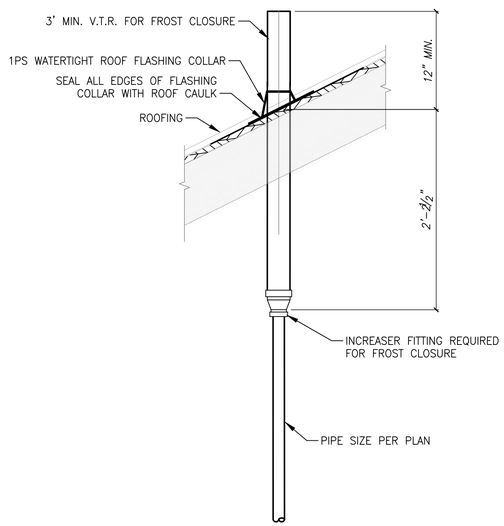
NOTES:
1. CONTRACTOR SHALL VERIFY ACTUAL QUANTITY OF FITTINGS BASED ON PLANS AND INSTALLATION CONSTRAINTS.
2. ALL DRAINAGE AND CARRIER CONDUITS SHALL BE INSTALLED WITH "LONG" SWEEP FITTINGS AND BENDS. COMPLY WITH SECTION 22 13 16.



NOTES:
1. UNLESS OTHERWISE NOTED, ALL PIPE INSIDE THE CHLORINE ROOM SHALL BE SCHEDULE 80 PVC.
2. ALL PIPE SHALL BE ANCHORED TO WALL W/ PVC SUPPORTS.
3. ALL CHLORINATION EQUIPMENT SHALL BE SUPPLIED BY REGAL, AND PURCHASED AND INSTALLED BY CST WITH EXCEPTION TO PVC PIPING AND ASSOCIATED EQUIPMENT. COMPLY WITH NOTES ON SHEET G1.3.
4. INSTALL CHLORINE GAS AUDIO AND ALARM LIGHT EXTERIOR TO THE BUILDING AND ADJACENT TO THE CHLORINE ROOM ACCESS DOOR.
5. MOUNT WARNING SIGN ON ACCESS DOOR AS NOTED ON P1.0, AND SUPPLY AND STORE RESPIRATOR AND CYLINDER REPAIR KIT IN THE PROCESS ROOM AT A LOCATION IDENTIFIED BY OWNER.

C / P1.2 CHLORINATION SYSTEM DETAIL

Scale: N.T.S.



1 / P1.2 PLUMBING VENT THROUGH ROOF

Scale: N.T.S.

REV.	DATE	
	01/08/2025	SURVEYED
	n/a	ENGINEERED
	JK	DRAWN
	BJG/JK	CHECKED
		APPROVED

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

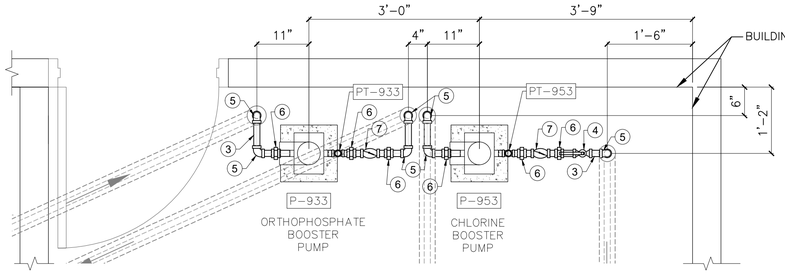
DRAWING TITLE: PUMP HOUSE UNDERGROUND PIPING PLAN & PROCESS DETAILS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

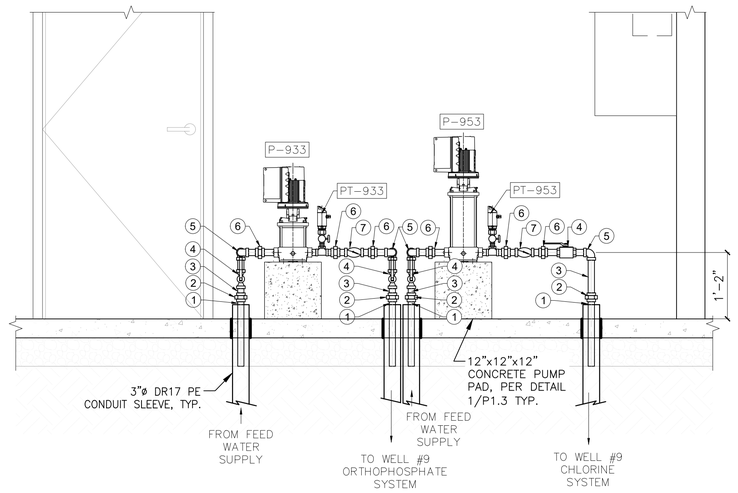
DRAWING NO: P1.2

JOB NO: 23-302-02

S:\Proj\2023\302-02 (toj) high school rd water supply facilities\4 drawings\Civil\HSR WH\WELL HOUSE PROCESS PLANS.dwg (PUMP HOUSE PROCESS DETAILS (2)) - Aug 28 2025 @ 08:39 am PLOTTED BY bjgstrick DWG FORMAT: 25D



PLAN



ELEVATION

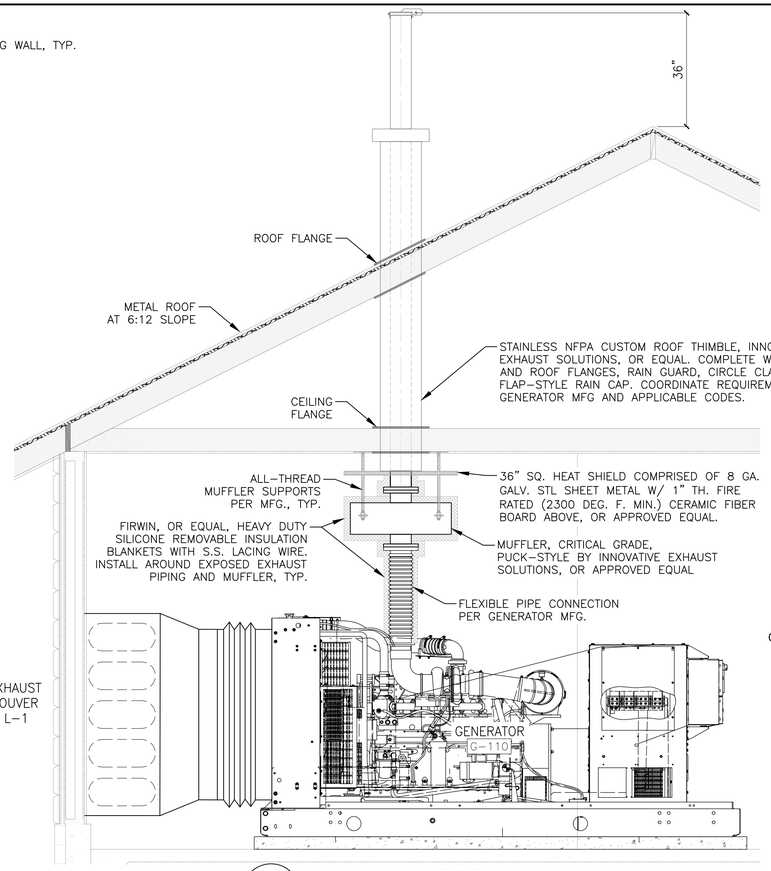
A P1.3 TURBINE PUMP DETAIL

Scale: N.T.S.

CHEMICAL BOOSTER PUMPS				
MARK	SIZE	QUANTITY	DESCRIPTION	SPEC SECTION
P-933	–	1	SEE PIPE AND EQUIPMENT TABLE SHEET P1.1	43 23 31
P-953	–	1	SEE PIPE AND EQUIPMENT TABLE SHEET P1.1	43 23 31
PT-933	–	1	PROVIDED BY PUMP MFG PER SECTION 43 21 13	25 30 00
PT-953	–	1	PROVIDED BY PUMP MFG PER SECTION 43 21 13	25 30 00
1	1"ø	–	HDPE PIPE (IPS) DR11 PE4710, 200 PSI	22 11 16
2	1"ø	4	COPPER HDPE TRANSITION FITTING	22 11 16
3	1"ø	–	SWEATED x COPPER PIPE PE x PE	22 11 16
4	1"ø	4	BALL VALVE BRASS/BRONZE	33 12 13
5	1"ø	7	90° BEND SWEATED COPPER	22 11 16
6	1"ø	6	UNION BRASS/BRONZE	22 11 16
7	1"ø	2	CHECK VALVE, WATTS LF600, OR EQUAL	22 11 16

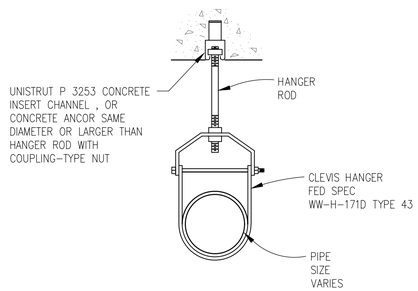
1 P1.3 EQUIPMENT PAD

Scale: N.T.S.



B P1.3 GENERATOR DETAIL

Scale: N.T.S.

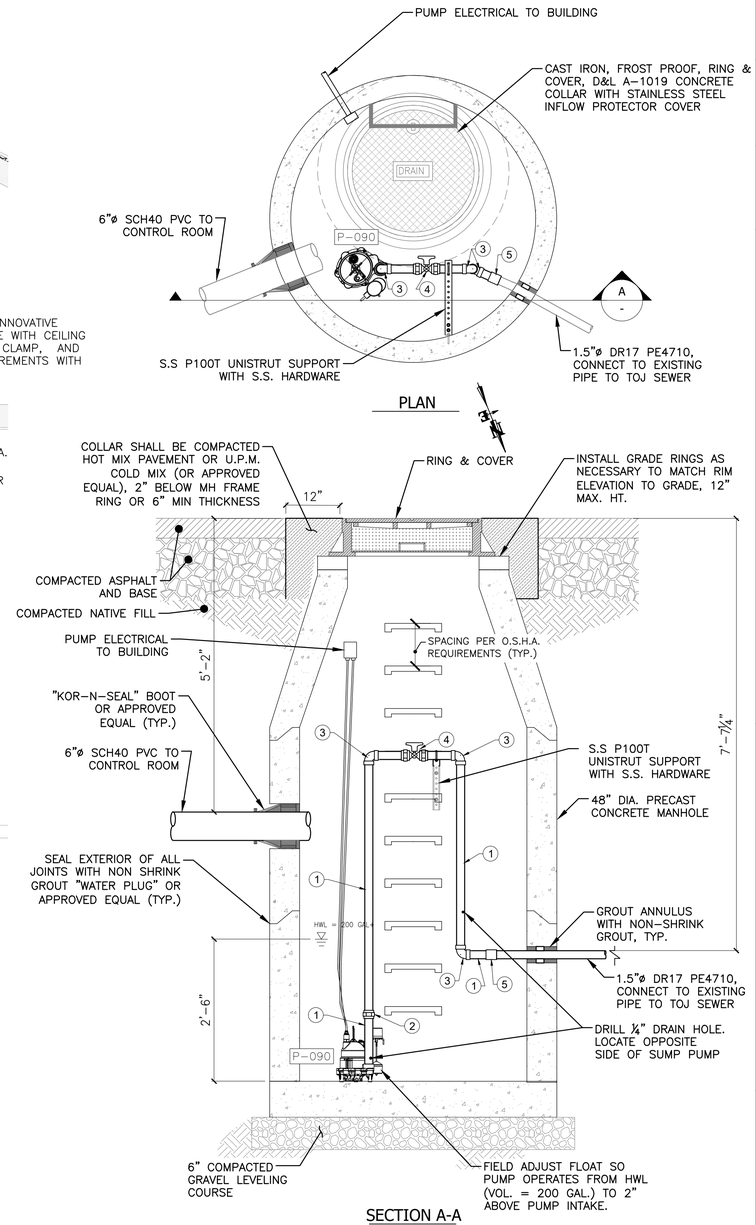


PIPE SIZE	HANGER ROD DIA
2" & SMALLER	3/8"
2 1/2"	1/2"
3" & 4"	5/8"
6" THRU 12"	3/4"

HANGER AND HARDWARE SHALL BE STAINLESS STEEL (S.S.)

2 P1.3 PIPE SUPPORT DETAIL

Scale: N.T.S.



SECTION A-A

C P1.3 SUMP MANHOLE DETAIL

Scale: N.T.S.

BUILDING DRAIN SYSTEM AND SUMP PUMP				
MARK	SIZE	QUANTITY	DESCRIPTION	SPEC SECTION
P-090	1/2 HP	1	SUMP PUMP, MEYERS MDC50 WITH FLOAT SWITCH, OR EQUAL	
1	1.5"ø	–	SCH80 PVC PIPE	22 11 16
2	1.5"ø	1	SCH80 PVC UNION	22 11 16
3	1.5"ø	3	SCH80 PVC ELBOW	22 11 16
4	1.5"ø	1	SCH 80 PVC UNION BALL VALVE	22 11 16
5	1.5"ø	1	PVC x HDPE TRANSITION FITTING	22 11 16
				22 11 16

REV.	DATE	
	01/08/2025	SURVEYED
	n/a	ENGINEERED
	JK	DRAWN
	BJG/JK	CHECKED
		APPROVED

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE: PUMP HOUSE PROCESS DETAILS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: P1.3

JOB NO: 23-302-02

S:\Proj\2023\302-02 (Tn) High School Rd Water Supply Facilities\14 Drawings\Civil\05 HOUSE PROCESS PLANS.dwg dPUMP HOUSE PROCESS DETAILS (3) - Jul 29 2025 12:28:37 pm PLOTTED BY jgreen DWG FORMAT: 25D

CONTRACTOR REQUIREMENTS

WORK ON EACH WELL WAS COMPLETED IN THREE PHASES. PHASE I AND II WORK HAS ALREADY BEEN, OR WILL BE COMPLETED BY OTHERS. **PHASE III WORK, DESCRIBED BELOW, IS REQUIRED FOR THIS PROJECT.**

PHASE I (BY OTHERS)

DRILL, TEST AND PERMIT WELLS #9 AND #10.

PHASE II (BY OTHERS)

IN ACCORDANCE WITH DETAIL 2/P1.4, WORK AT EACH WELL INCLUDES:

1. CUT WELL CASING AND INSTALL PITLESS ADAPTOR. CONNECT WATER SUPPLY LINE TO PITLESS.
2. FOR WELL #10 ONLY, INSTALL CHEMICAL (CHLORINE AND POLYP) PITLESSES (2 EA.) AND CONNECT TO BURIED CHEMICAL PIPING. TERMINATE CARRIER CONDUIT W/IN 2' OF WELL HEAD AND SEAL ANNULUSES BETWEEN CHEMICAL LINE AND CARRIER PIPE WITH MECHANICAL SEAL, SILICON OR OTHER APPROVED PRODUCT.
3. INSTALL WELL CAP AND ELECTRICAL POWER CONDUIT FROM THE WELL CAP TO FUTURE LOCATION OF THE WELL DISCONNECT; THIS IS THE SAME LOCATION WHERE POWER SUPPLY WILL BE STUBBED UP AND CAPPED ABOVE GRADE PER PLAN. COORDINATE LOCATION OF FUTURE DISCONNECT WITH OWNER/ENGINEER. ELECTRICAL CONDUIT ABOVE GRADE SHALL BE GALVANIZED STL. IN ACCORDANCE WITH NEC.
4. CONNECT 1"ø CONDUIT FOR FUTURE PRESSURE TRANSDUCER CABLE TO WELL CAP.
5. INSTALL CONCRETE WELL PAD AND WELL ENCLOSURE.
6. COMPLETE ALL REQUIRED EXCAVATION AND BACKFILL. THIS INCLUDES PIPE BEDDING AND RE-ESTABLISHMENT OF THE GROUT SEAL AROUND THE WELL HEAD FROM THE BOTTOM OF THE DISCONNECT TO FINISH GRADE.

PHASE III (THIS PROJECT)

IN GENERAL, WORK INCLUDES INSTALLING ALL EQUIPMENT AND ELECTRICAL FOR FINAL WELL COMPLETION; WORK NOT INCLUDED IN PHASE I OR II WORK. PHASE III WORK INCLUDES COMPLETION OF THE WELL IN ACCORDANCE WITH DETAIL 2/P1.4 AND ITEMS LISTED BELOW.

1. REMOVE WELL PROTECTIVE COVER, CAP AND PITLESS AND FURNISH AND INSTALL PUMP, MOTOR, FLOW INDUCER, PUMP/MOTOR CENTRALIZERS, CHECK VALVE AND COLUMN PIPE. CONTRACTOR SHALL CONFIRM CONNECTIONS TO EXISTING PITLESS ADAPTOR PRIOR TO ORDERING PARTS AND EQUIPMENT.

2. FURNISH AND INSTALL WELL DISCONNECT IN PEDESTAL (MYERS) TO WELL MOTOR. NOTE: EXISTING BURIED CONDUITS ARE ALREADY STUB UP AT H-FRAME/DISCONNECT LOCATION.

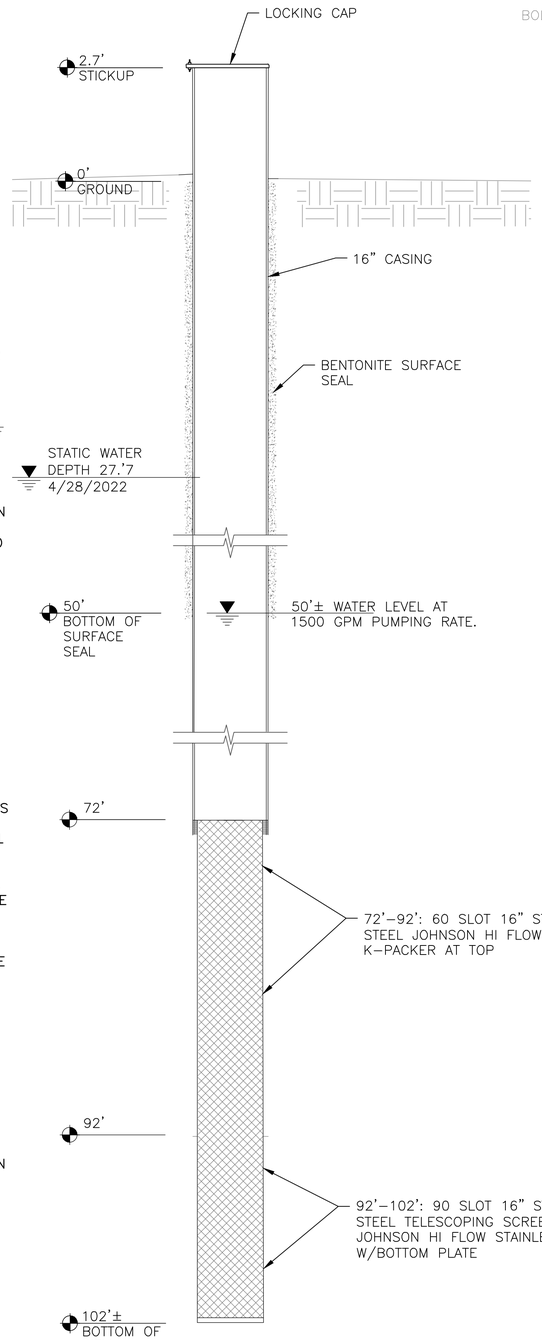
3. FURNISH AND INSTALL (PULL) ALL ELECTRICAL CONDUCTORS FROM THE PUMP HOUSE AND WELL PUMP MOTOR, AND TERMINATE AT THE WELL DISCONNECT. PROVIDE ALL NECESSARY EQUIPMENT AND CONNECTIONS REQUIRED FOR WELL OPERATION. NOTE: THE MAJORITY OF EXISTING CONDUITS AND PULL STRINGS WERE INSTALLED UNDER PHASE II WORK; SEE SHEET C1.1 FOR ADDITIONAL BURIED CONDUIT AND PULL BOX REQUIREMENTS AT THE PUMP HOUSE.

4. FURNISH AND INSTALL PRESSURE TRANSDUCER IN WELLHEAD. FURNISH AND INSTALL (PULL) CABLE FROM THE PUMP HOUSE TO THE WELLHEAD FOR THE PRESSURE TRANSDUCER. PROVIDE ALL NECESSARY EQUIPMENT AND CONNECTIONS REQUIRED FOR INSTRUMENT OPERATION. NOTE: EXISTING CONDUITS AND PULL STRINGS WERE INSTALLED UNDER PHASE II WORK; SEE SHEET C1.1 FOR ADDITIONAL BURIED CONDUIT AND PULL BOX REQUIREMENTS AT THE PUMP HOUSE.

5. FOR WELL #10 ONLY, FURNISH AND INSTALL LIFT AND DROP/COLUMN PIPES FOR CHEMICAL FEED (2 EA.) TO WELL CASING DEPTHS INDICATED IN DETAIL 2/P1.4. CONNECT PIPE TO EXISTING PITLESS ADAPTORS AND ATTACH PE PIPE TO PUMP COLUMN PUMP COLUMN PIPE.

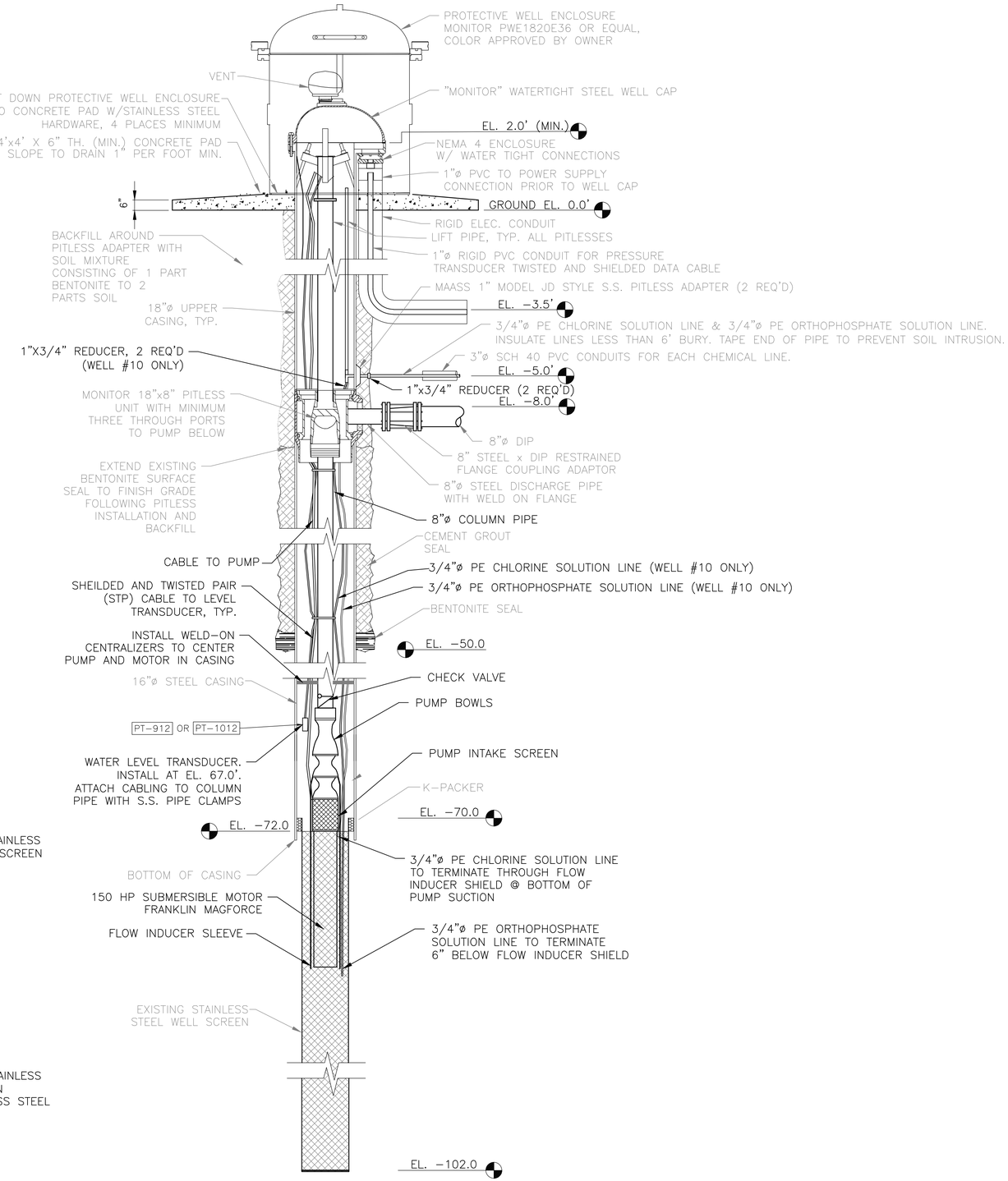
6. SECURE ALL CABLES AND CHEMICAL PIPES TO CENTER COLUMN PIPE WITH S.S. BANDS, OR APPROVED EQUAL. CONTRACTOR SHALL PROVIDED ALL NECESSARY EQUIPMENT AND ATTACHMENTS SO THAT ALL PIPE AND EQUIPMENT WITHIN THE WELL CASING CAN BE READILY PULLED FROM THE WELL FREE OF DAMAGE.

7. COMPLETE WELL STARTUP, COMMISSIONING AND TRAINING. COORDINATE WITH ToJ's CONTROLS CONTRACTOR, CONTROLS SYSTEMS TECHNOLOGY (CST).



1 / P1.4 EXISTING WELL #9 & #10

Scale: N.T.S.



2 / P1.4 WELL #9 & #10 COMPLETION

Scale: N.T.S.

NOTE: FURNISH AND INSTALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH 33 21 13 - PUBLIC WATER SUPPLY WELLS.

REV.		
DATE	7/24/2024	
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE: WELL NO. 9 & 10 DETAILS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL HOUSE
TOWN OF JACKSON, WY

DRAWING NO: P1.4

JOB NO: 23-302-02

S:\Proj\2023\302-02 (to) High school rd water supply facilities\dwg\Civil\WSR WHA\WELL 9 & 10 DETAILS.dwg, 8P1.4 WELL NO. 9 & 10 DETAILS, - Aug 28 2025 04:26:45 am PLOTTED BY: kkostrick DWG FORMAT: 25.0

PROJECT SITE PLAN

SCALE: 1" = 120' (11x17)

0 60 120

CONSTRUCTION NOTES

EXISTING

1. 3 EA. – 4"ø ELEC. CONDUITS, AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM PUMP HOUSE TO WELL #9 WITH PULL TAPE. PULL BOXES PROVIDED EVERY 500–FT (MAX.).
2. 1 EA. – 3"ø ELEC. CONDUIT AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM PUMP HOUSE TO WELL #10 WITH PULL TAPE.
3. 1 EA. – 4"ø ELEC. CONDUIT AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM PUMP HOUSE TO FUTURE WELL #11 LOCATION WITH PULL TAPE. PULL BOXES PROVIDED EVERY 500–FT (MAX.).
4. EXISTING ELECTRICAL PULL BOX.
5. WELL #9 CHEMICAL (CHLORINE & ORTHOPHOSPHATE) INJECTION VAULT.
6. EXISTING WELL WATER SUPPLY AND TRANSMISSION MAINS (4 EA.) EXTENDING THROUGH PUMP HOUSE FLOOR. SEE DETAIL A/P1.1.
7. EXISTING WELL WATER SUPPLY LINES (10"ø AND 20"ø HDPE) AND ASSOCIATED CHEMICAL LINES (2 EA. – CHLORINE & ORTHOPHOSPHATE) BURIED IN THE SAME TRENCH FROM THE HSR PUMP HOUSE TO WELL #9 CHEMICAL INJECTION VAULT, WELL #10, OR FUTURE WELL #11 LOCATION.
8. CONNECTION OF HSR PUMP HOUSE SUPPLY TO EXISTING ToJ WATER SYSTEM DISTRIBUTION.

WORK UNDER THIS PROJECT

1. COMPLETE WELL #9 IN ACCORDANCE WITH SHEET P1.4. REPAIR ANY DAMAGED LANDSCAPING TO PRECONSTUCTION CONDITIONS.
2. COMPLETE WELL #10 IN ACCORDANCE WITH SHEET P1.4.
3. INSTALL WELL DISCONNECT PER ELECTRICAL PLANS.
4. PULL AND CONNECT POWER CONDUCTORS AND PRESSURE TRANSDUCER CABLE FROM HSR PUMP HOUSE TO EXISTING WELLS; 1860±LF FOR WELL #9 AND 60± L.F. FOR WELL #10. COMPLY WITH CONDUCTOR REQUIREMENTS IN ELECTRICAL PLANS.
5. CONNECT SUMP PUMP TO EXISTING DRAIN LINE, SEE P1.0 & DETAIL C/P1.3.
6. COORDINATE INSTALLATION OF BUILDING ELECTRICAL SERVICE AND TRANSFORMER (INCLUDING CONCRETE PAD) WITH UTILITY PROVIDER LOWER VALLEY ENERGY AND OWNER/ENGINEER. COSTS FOR EQUIPMENT (TRANSFORMER, ETC.), LABOR AND SERVICE FEES BY LVE SHALL BE PAID FOR BY OWNER.

		REV.
DATE	01/08/2025	
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

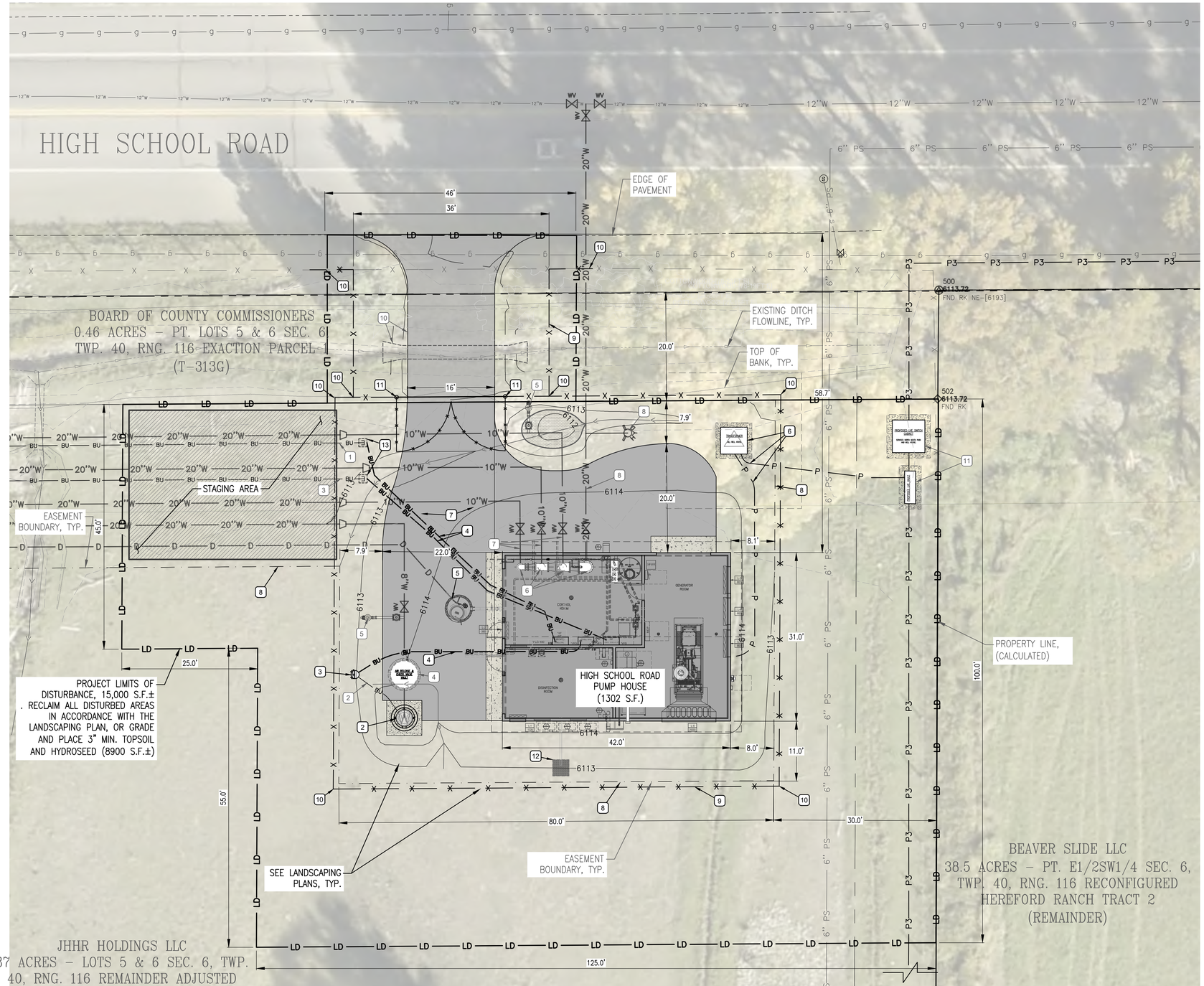
DRAWING TITLE
PROJECT SITE PLAN

JOB TITLE
HIGH SCHOOL ROAD (HSR)
WELL AND PUMP HOUSE FACILITIES
TOWN OF JACKSON, WY

DRAWING NO **C1.0**

JOB NO **23-302-02**

S:\Proj\2023\302-02 (tu) high school rd water supply facilities\14 drawings\Civil\Well 9 Alt Connection Plans\TU-WELL #9 CONNECTION.dwg PROJECT SITE PLAN - May 05 2025 024456 gm PLOTTED BY: green DWG FORMAT: 25D



HSR PUMP HOUSE SITE PLAN

SCALE: 1" = 20' (11x17)

0 10 20

CONSTRUCTION NOTES

EXISTING

1. 3 EA. – 4"ø ELEC. CONDUITS, AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM PULL BOX BY PUMP HOUSE TO WELL #9 WITH PULL TAPE. PULL BOXES PROVIDED EVERY 500–FT (MAX.).
2. 1 EA. – 3"ø ELEC. CONDUIT AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM WELL #10 LOCAL DISCONNECT TO WELL #10 WITH PULL TAPE.
3. 1 EA. – 4"ø ELEC. CONDUIT AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM PULL BOX BY PUMP HOUSE TO FUTURE WELL #11 LOCATION WITH PULL TAPE. PULL BOXES PROVIDED EVERY 500–FT (MAX.).
4. VALVE VAULT INSTALLED AS PART OF THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT
5. BLOW–OFF HYDRANT INSTALLED AS PART OF THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT.
6. EXISTING WELL WATER SUPPLY AND TRANSMISSION MAINS (4 EA.) EXTENDING THROUGH PUMP HOUSE FLOOR. SEE DETAIL A/P1.1.
7. EXISTING WELL WATER SUPPLY LINES (10"ø AND 20"ø HDPE) AND ASSOCIATED CHEMICAL LINES (2 EA. – CHLORINE & ORTHOPHOSPHATE) BURIED IN THE SAME TRENCH FROM THE HSR PUMP HOUSE TO WELL #9 CHEMICAL INJECTION VAULT, WELL #10, OR FUTURE WELL #11 LOCATION.
8. CONNECTION OF HSR PUMP HOUSE SUPPLY TO EXISTING ToJ WATER SYSTEM DISTRIBUTION.
9. FIRE HYDRANT INSTALLED AS PART OF THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT.
10. EXISTING CULVERT AND ROUGHED–IN ACCESS DRIVE INSTALLED AS PART OF THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT.
11. LVE SWITCH CABINET AND VAULT, SERVICE TO NEW PUMP HOUSE AND NORTH SOUTH PARK DEVELOPMENT

WORK UNDER THIS PROJECT

1. COMPLETE WELL #9 IN ACCORDANCE WITH SHEET P1.4.
2. COMPLETE WELL #10 IN ACCORDANCE WITH SHEET P1.4.
3. INSTALL MEYERS POWER PEDESTAL WITH INTEGRAL WELL DISCONNECT PER ELECTRICAL PLANS.
4. INSTALL BURIED POWER AND DATA CONDUITS FROM PULL/SPLICE BOXES (WELLS #9 & #11), OR DISCONNECT (WELL #10), TO PUMP HOUSE TERMINATION. PULL AND CONNECT POWER CONDUCTORS AND PRESSURE TRANSDUCER CABLE FROM HSR PUMP HOUSE TO EXISTING WELLS; 1860±LF FOR WELL #9 AND 60± L.F. FOR WELL #10. COMPLY WITH CONDUIT & CONDUCTOR REQUIREMENTS IN ELECTRICAL PLANS.
5. CONNECT SUMP PUMP TO EXISTING DRAIN LINE, SEE P1.0 & DETAIL C/P1.3.
6. COORDINATE INSTALLATION OF BUILDING ELECTRICAL SERVICE AND TRANSFORMER (INCLUDING CONCRETE PAD) WITH UTILITY PROVIDER LOWER VALLEY ENERGY (LVE) AND OWNER/ENGINEER. COMPLY WITH STANDARD DETAILS PROVIDED IN THE MOST CURRENT VERSION OF LVE'S "ELECTRIC AND NATURAL GAS SERVICE REQUIREMENTS." ALL BURIED FACILITIES SHALL BE INSPECTED BY LVE AND ENGINEER PRIOR TO BACKFILL. COSTS FOR EQUIPMENT (TRANSFORMER, ETC.), LABOR AND SERVICE FEES BY LVE SHALL BE PAID FOR BY OWNER.
7. PUMP HOUSE PAVED DRIVEWAY AND PARKING, COMPLETE PER SHEET C1.2
8. INSTALL TEMPORARY FENCING WITHIN OR AT UTILITY EASEMENT AND AT PROPERTY LINE BOUNDARIES IN ACCORDANCE WITH NOTE 6 ON SHEET T1.0.
9. INSTALL FENCE AT EASEMENT LINE AND LOCATIONS SHOWN IN PLAN. SEE DETAIL 2/C2.1
10. TIE INTO EXISTING FENCE AND INSTALL H–BRACE ASSEMBLY PER DETAIL 2/C2.1
11. 8"ø GATE POST WITH COUNTRYLINE POWDER–COATED 10–FT HEAVY–DUTY TUBE GATE, OR EQUAL.
12. CONSTRUCT DRY WELL AT PROPERTY LINE PER DETAIL 5/C2.1. PROVIDED THE PROXIMITY TO THE WELL, NO CLEANING AGENTS OTHER THAN CHLORINE ARE ALLOWED IN THE CHLORINE ROOM. IF FUTURE MEANS OF POTABLE WATER DISINFECTION CHANGE FROM CHLORINE GAS TO ALTERNATIVE PROCESS, THE DRAIN SHALL BE EXPOSED AND CONNECTED TO THE EXTERIOR MANHOLE LIFT STATION LOCATED EAST OF THE PUMP/WELL HOUSE.
13. INSTALL TRAFFIC RATED BELOW GRADE ELECTRICAL SPLICE/PULL BOX.

GENERAL

1. **COMPLY WITH CONSTRUCTION NOTES ON SHEET T1.0 AND FINAL SITE GRADING AND SURFACE IMPROVEMENT REQUIREMENTS ON SHEET C1.2.**
2. ALL BURIED FACILITIES AND PIPE SHALL BE INSPECTED BY ENGINEER PRIOR TO BACKFILL.
3. STRIPPED MATERIAL SHALL BE STOCKPILED AT STOCKPILE AREAS SHOWN ON PLAN, CUT MATERIAL WILL BE PLACED DIRECTLY INTO FILL AREAS OR STOCKPILED. COMPLY WITH NOTES ON SHEET C1.0 AND PLAN ABOVE REGARDING APPROVED LOCATIONS FOR STOCKPILING, STAGING AND CONSTRUCTION.
4. IN LANDSCAPING AREAS SCHEDULE FOR DISTURBANCE, TOPSOIL SHALL BE STRIPPED TO A MINIMUM DEPTH OF 6–INCHES AND STOCKPILED SEPARATELY FOR REUSED TO COVER FINISH SLOPES. IMPORT ADDITIONAL WEED–FREE TOPSOIL IF NECESSARY TO COVER ALL DISTURBED AREAS NOT RECEIVING SURFACING. LEAVE SUBGRADE DOWN 4" TO 6" BELOW EXISTING GRADES IN AREAS RECEIVING TOPSOIL.
5. DUST CONTROL MUST BE ACCOMPLISHED BY WATERING STOCKPILES AND DRY SOILS AREAS DISTURBED BY PROJECT CONSTRUCTION.
6. CONTRACTOR SHALL PREVENT TRACKING OF SOIL ONTO THE ROAD AND CLEAN ROAD OF SOILS WHEN NECESSARY.
7. INSTALL EROSION CONTROL MEASURES TO PREVENT MIGRATION OF SOILS/SEDIMENT FROM THE PROJECT SITE. MAINTAIN THE DEVICES THROUGHOUT PROJECT CONSTRUCTION. ENGINEER/OWNER MAY REQUEST IMPLEMENTATION OF EROSION CONTROL DEVICES INCLUDING SMALL SWALES, BERMS, SEDIMENT LOGS AND SILT FENCE TO DIVERT WATER FROM CONSTRUCTION AND PREVENT MIGRATION OF SOILS FROM THE SITE. WHERE PROVIDED, EROSION CONTROL DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH DETAILS PROVIDED IN THESE PLANS.
8. REVEGETATION SHALL BE NATIVE SEED (HYDROSEED) AND SOD AND SHALL BE IRRIGATED BY OWNER WHEN NECESSARY.
9. CONTRACTOR MUST HAVE A WEED CONTROL PLAN PREPARED BY TETON COUNTY WEED AND PEST OR OTHER WEED SPECIALIST AND IMPLEMENT THE PLAN THROUGHOUT CONSTRUCTION. SEE NOTES ON THIS SHEET FOR WEED MANAGEMENT REQUIREMENTS. SEE REQUIREMENTS ON SHEET C1.2.
10. LAND DISTURBING ACTIVITIES SHALL OCCUR FROM SUMMER 2025 THROUGH FALL 2026, OR AS LIMITED BY THE CONTRACT SCHEDULE.
11. REFERENCE GEOTECHNICAL REPORT 23–302–02, DECEMBER 2024. CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FOR FOUNDATION SOILS PREPARATION, FOUNDATION DRAIN PLACEMENT, FOUNDATION BACKFILL, DRIVEWAY CONSTRUCTION, AND OTHER SOIL PREPARATION FOR SLABS AND UTILITIES.

REV.		
DATE	01/08/2025	
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733–2087

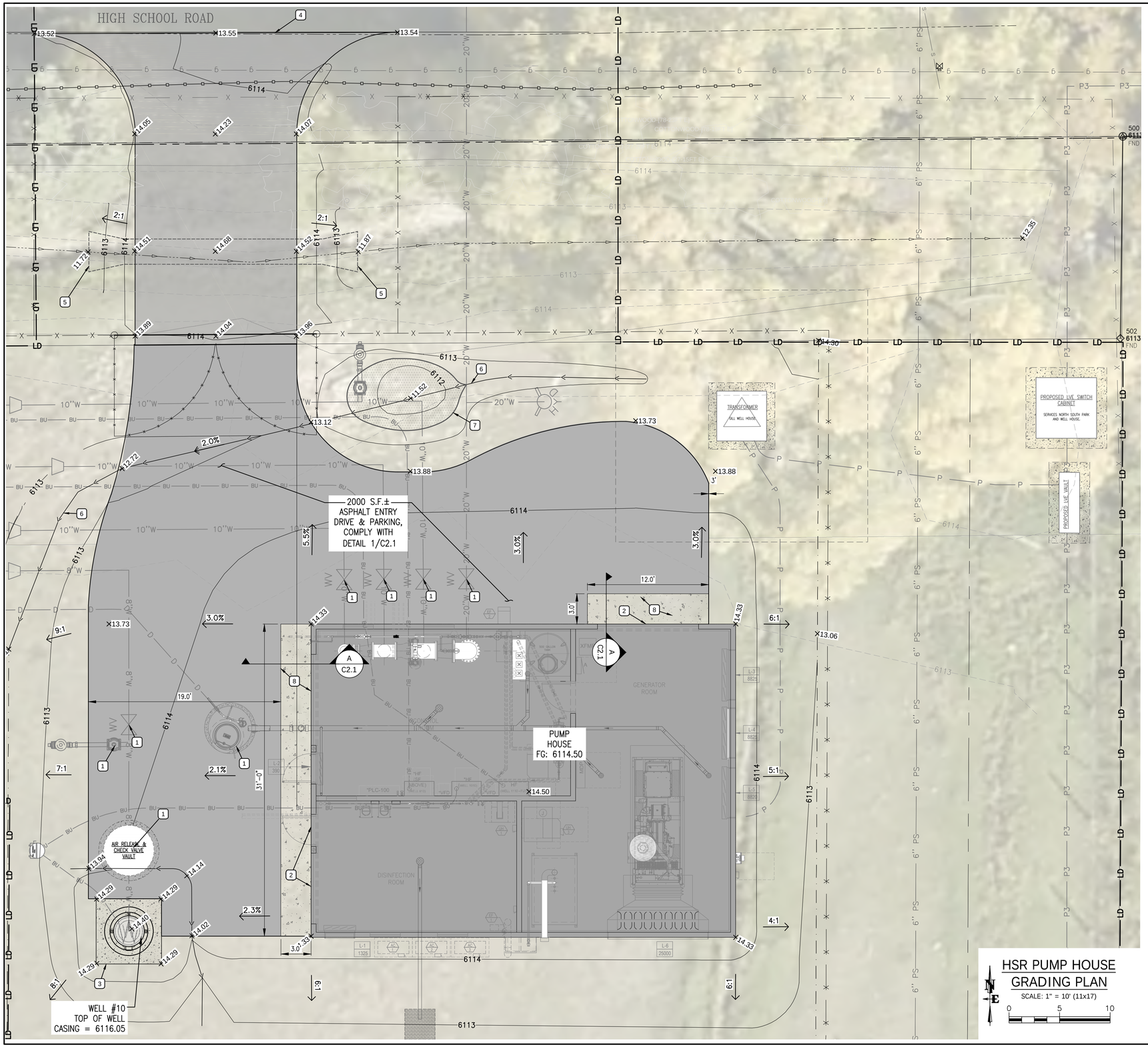
DRAWING TITLE: HSR PUMP HOUSE SITE PLAN

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: C1.1

JOB NO: 23–302–02

S:\Proj\2023\302-02 Toj High school rd water supply facilities\4 drawings\Civil\HSR WHITED HSR Well House Site Plan.dwg HSR PUMP HOUSE SITE PLAN - Aug 28 2025 03:49:53 am PLOTTED BY Abdulrick DWG TO PDF.pc3



HSR PUMP HOUSE GRADING PLAN

SCALE: 1" = 10' (11x17)

0 5 10

TETON COUNTY WEED AND PEST MANAGEMENT STRATEGIES

PRE-CONSTRUCTION MANAGEMENT STRATEGIES TO BE PERFORMED BY CONTRACTOR:

1. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL CONTACT THE TETON COUNTY WEED & PEST, OR OTHER QUALIFIED PROFESSIONAL, TO CONDUCT A SITE SPECIFIC INVENTORY OF INVASIVE SPECIES AND CREATE A SPECIES SPECIFIC MANAGEMENT PLAN IN ACCORDANCE WITH TETON COUNTY LDR 5.7.2.

ACTIVE CONSTRUCTION MANAGEMENT STRATEGIES TO BE PERFORMED BY CONTRACTOR:

1. ALL CONSTRUCTION EQUIPMENT TO BE CLEANED PRIOR TO ENTERING THE SITE.
2. SOIL STOCKPILES TO BE ROUTINELY CHECKED AND TREATED FOR INVASIVE SPECIES.
3. DISTURBANCE OUTSIDE OF THE CONSTRUCTION ZONE AND IN AREAS WHERE INVASIVE SPECIES ARE PRESENT SHALL BE MINIMIZED.
4. ALL AREAS OUTSIDE OF THE CONSTRUCTION ZONE SHALL BE KEPT ON ACTIVE MANAGEMENT USING THE CONTROL METHODS PRESCRIBED IN THE SPECIES SPECIFIC MANAGEMENT PLAN CREATED PRIOR TO CONSTRUCTION. THIS AREA SHALL BE MONITORED AND TREATED AT LEAST TWICE EACH GROWING SEASON.

POST-CONSTRUCTION MANAGEMENT STRATEGIES TO BE PERFORMED BY CONTRACTOR:

1. RE-VEGETATION TO OCCUR IMMEDIATELY AFTER CONSTRUCTION IS COMPLETE TO PREVENT THE ESTABLISHMENT OF INVASIVE SPECIES IN DISTURBED AREAS.
2. NURSERY STOCK SHALL BE IN ACCORDANCE WITH W.S. 11-9-101 – 109 (WYOMING NURSERY STOCK LAW), ACCOMPANIED BY A VALID HEALTH CERTIFICATE, AND ACQUIRED THROUGH A DEALER LICENSED BY THE WYOMING DEPARTMENT OF AGRICULTURE. SEEDS SHALL BE IN ACCORDANCE WITH W.S. 11-12-101 – 125 (WYOMING SEED LAW), CERTIFIED WEED FREE, AND ACQUIRED THROUGH A DEALER LICENSED BY THE WYOMING DEPARTMENT OF AGRICULTURE.
3. CERTIFIED WEED FREE STRAW, GRAVEL, AND SOIL SHALL BE UTILIZED WHERE POSSIBLE.
4. TCWP TO BE CONTACTED TO CREATE A POST-CONSTRUCTION INVENTORY.

CONSTRUCTION NOTES

EXISTING

1 XXXX

WORK UNDER THIS PROJECT

1. ADJUST EXISTING MANHOLE LIDS AND VALVE COLLARS TO FINAL GRADE PER DETAILS W-106 & SS-109\C2.0
2. ADJUST GRADE 3/4" BELOW ELEVATION OF BUILDING SLAB AT ALL DOORS, TYP.
3. ADJUST GRADE 0.5" BELOW CONCRETE WELL PAD.
4. MATCH DRIVEWAY TO EXISTING PAVEMENT AT HIGH SCHOOL ROAD.
5. MAINTAIN GRADES AND OPEN CHANNEL AT EXISTING CULVERT ENTRANCE.
6. FLOWLINE SWALE
7. DETENTION AREA
8. 6" TH. CONCRETE PAD PER DETAIL SECTION A/C2.1.

DATE	01/06/2025
SURVEYED	n/a
ENGINEERED	JK
DRAWN	BJG/JK
CHECKED	
APPROVED	

REV.

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

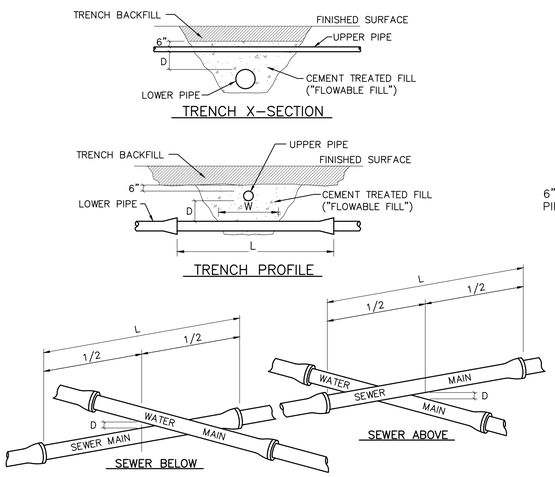
DRAWING TITLE
HSR PUMP HOUSE GRADING PLAN

JOB TITLE
HIGH SCHOOL ROAD (HSR)
WELL AND PUMP HOUSE FACILITIES
TOWN OF JACKSON, WY

DRAWING NO
C1.2

JOB NO
23-302-02

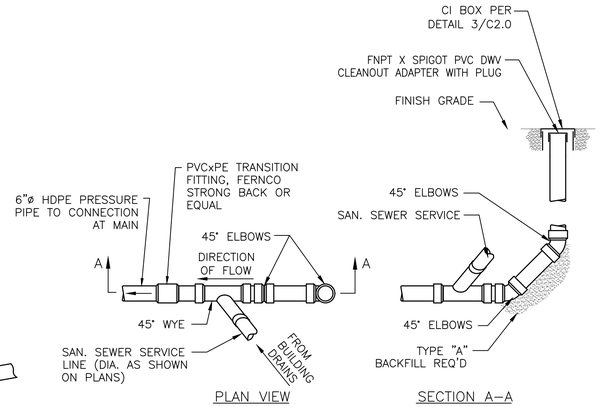
S:\Proj\2023\302-02 tcsj High school rd water supply facilities\4 drawings\Civil\HSR WHITLO HSR Well House Site Plan.Dwg HSR PUMP HOUSE GRADING PLAN - Aug 25, 2025 8:58:24 pm PLOTTED BY Hbostrick DWG TEMPLATE



NOTES:

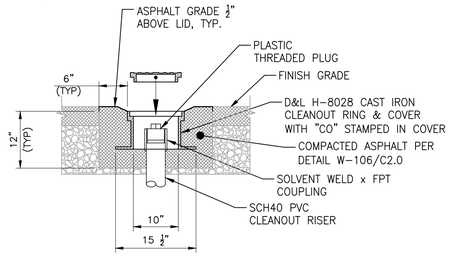
1. CEMENT TREATED FILL ("FLOWABLE FILL") SHALL CONFORM TO WPWSS SECTION 02225, PART 2.01B. IF CALLED FOR ON THE PLANS, CONTRACTOR MAY SLEEVE PIPE IN LIEU OF USING FLOWABLE FILL.
2. CEMENT TREATED FILL SHALL BE PLACED FROM BOTTOM OF LOWER PIPE TO 6 INCHES ABOVE THE UPPER PIPE.
3. DIMENSION D (THE VERTICAL SEPARATION BETWEEN THE OUTSIDES OF THE UPPER AND LOWER PIPES) SHALL BE 18 INCHES MINIMUM.
4. DIMENSION W SHALL EQUAL 3D PLUS 1 FOOT.
5. DIMENSION L SHALL EQUAL 20 FEET MINIMUM.
6. WHERE THE MINIMUM REQUIRED CLEARANCES FOR DIMENSIONS D AND L CANNOT BE MAINTAINED, THE SEWER MAIN SHALL BE PLACED WITHIN A SEPARATE SLEEVE.

1 / C2.0 WATER/SEWER MAIN CROSSING
SCALE: NTS

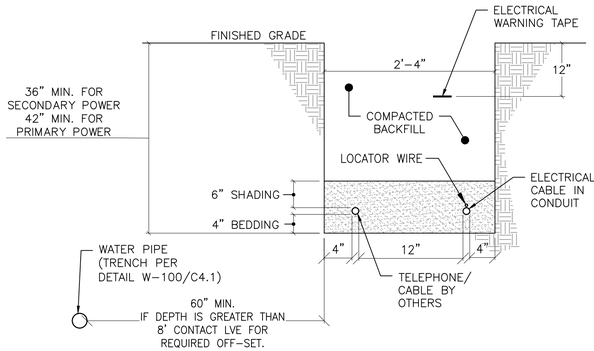


NOTE: CLEANOUT SHALL HAVE THE SAME DIAMETER AS SEWER LINE.

2 / C2.0 CLEANOUT DETAIL
SCALE: NTS



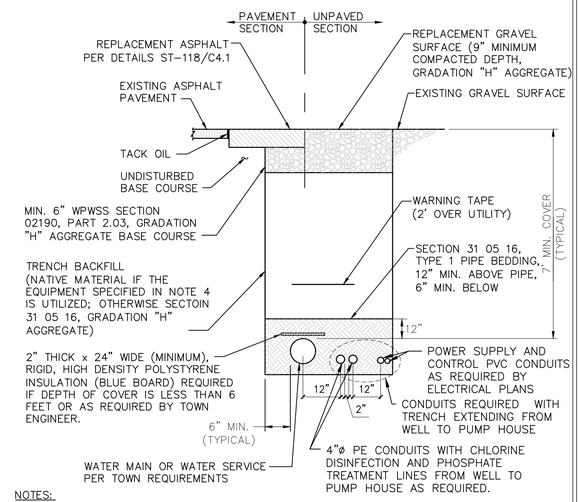
3 / C2.0 CLEANOUT ACCESS- PAVED AREAS
SCALE: NTS



NOTES:

1. WHEN ELECTRICAL CONDUCTORS CROSS OVER OR UNDER WATER AND/OR SEWER PIPES THERE SHALL BE A MINIMUM OF 12" VERTICAL SEPARATION. IN ADDITION, THE ELECTRICAL CONDUCTORS SHALL BE PROTECTED WITH NOT LESS THAN 48" OF SUITABLE PVC OR RIGID STEEL CONDUIT WITH NO LESS THAN 24" ON EITHER SIDE OF THE CROSSING.
2. CONSUMER INSTALLED CONDUIT MUST BE INSPECTED PRIOR TO BACKFILLING. IF NOT INSPECTED, TRENCH MAY BE REJECTED.
3. ALL TRENCHES ARE TO BE INSPECTED PRIOR TO BACKFILLING.
4. BEDDING AND SHADING MATERIAL MUST BE SMOOTH, FREE OF ROCKS, AND MUST BE ABLE TO SIFT THROUGH A 1/4" SCREEN (SAND RECOMMENDED).

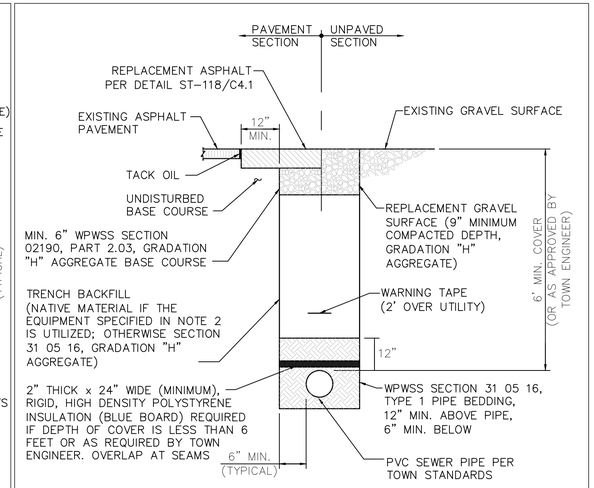
4 / C2.0 LVE MIXED UTILITY TRENCH & SPACING REQUIREMENTS
SCALE: NTS



NOTES:

1. TRENCH BACKFILL BELOW THE SURFACE SHALL MEET THE FOLLOWING CRITERIA:
   - 95% MODIFIED PROCTOR DENSITY WITHIN STREET AND ALLEY RIGHTS-OF-WAY.
   - 90% MODIFIED PROCTOR DENSITY OUTSIDE STREET AND ALLEY RIGHTS-OF-WAY.
2. COMPACTION OF NATIVE TRENCH BACKFILL, WITH ALL ROCK LARGER THAN 6" REMOVED, SHALL BE CARRIED OUT IN 2' LIFTS WITH A HOE-PACK OR A VIBRATORY SHEEPS FOOT ROLLER (COMPACTION METHOD AND EQUIPMENT SHALL BE REVIEWED AND APPROVED BY TOWN ENGINEER PRIOR TO BACKFILLING).
3. PIPE BEDDING SHALL BE PLACED IN 6" LIFTS AND THOROUGHLY COMPACTED WITH A JUMPING JACK TO PROVIDE UNIFORM PIPE SUPPORT.
4. UNLESS OTHERWISE DIRECTED, ALL BASE COURSE AND GRAVEL SURFACE REPLACEMENT SHALL BE INSTALLED PER SECTION 31 23 23.
5. ALL TRENCH EXCAVATION SHALL CONFORM TO WYOMING OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION (WYOSHA) REGULATIONS.

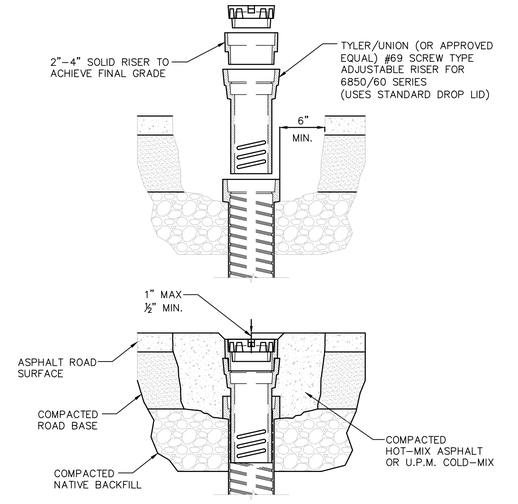
W-100 / C2.0 WATER MAIN AND SERVICE LINE TRENCH
W-100 DATE: 1/14/13 SCALE: NTS



NOTES:

1. TRENCH BACKFILL BELOW THE SURFACE SHALL MEET THE FOLLOWING CRITERIA:
   - 95% MODIFIED PROCTOR DENSITY WITHIN STREET AND ALLEY RIGHTS-OF-WAY.
   - 90% MODIFIED PROCTOR DENSITY OUTSIDE STREET AND ALLEY RIGHTS-OF-WAY.
2. COMPACTION OF NATIVE TRENCH BACKFILL, WITH ALL ROCK LARGER THAN 6" REMOVED, SHALL BE CARRIED OUT IN 2' LIFTS WITH A HOE-PACK OR A VIBRATORY SHEEPS FOOT ROLLER (COMPACTION METHOD AND EQUIPMENT SHALL BE REVIEWED AND APPROVED BY TOWN ENGINEER PRIOR TO BACKFILLING).
3. PIPE BEDDING SHALL BE PLACED IN 6" LIFTS AND THOROUGHLY COMPACTED WITH A JUMPING JACK TO PROVIDE UNIFORM PIPE SUPPORT.
4. UNLESS OTHERWISE DIRECTED, ALL BASE COURSE AND GRAVEL SURFACE REPLACEMENT SHALL BE INSTALLED PER WPWSS SECTION 31 23 23.
5. ALL TRENCH EXCAVATION SHALL CONFORM TO WYOMING OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION (WOSHA) REGULATIONS.

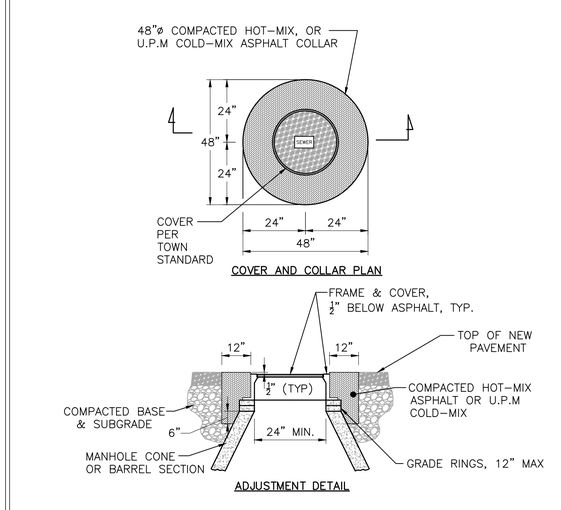
SS-100 / C2.0 SEWER MAIN & SERVICE TRENCH DETAIL
SS-100 DATE: 1/10/13 SCALE: NTS



NOTES:

1. ADJUST WATER VALVES UPWARD OR DOWNWARD AS REQUIRED. FINAL ADJUSTMENT SHALL BE MADE AFTER PAVING AND BEFORE SEAL COATING.
2. THE TOWN SHALL INSPECT THE VERTICAL ALIGNMENT PRIOR TO AND POST BACKFILLING.
3. MUD PLUGS ARE REQUIRED TO BE PLACED IN ALL VALVE BOXES.

W-106 / C2.0 WATER VALVE COLLAR ASSEMBLY
W-106 DATE: 1/16/13 SCALE: NTS



NOTES:

1. ADJUST MANHOLE UPWARD WITH ADJUSTING RINGS UNDER FRAME. ADJUST MANHOLE DOWNWARD BY REMOVING A PORTION OF THE MANHOLE RISER AND REBUILDING TO PROPER HEIGHT. SLOPE MANHOLE RING AS REQUIRED TO MATCH STREET GRADE AND CROSS SLOPE. MAKE FINAL MANHOLE ADJUSTMENT AFTER PAVING AND BEFORE SEAL COATING.
2. IF MANHOLE IS WITHIN UNPAVED AREA USE TAPERED COLLAR. SEE TOWN SANITARY SEWER DETAIL SS-110.

SS-109 / C2.0 MANHOLE ADJUSTMENT & COLLAR DETAIL FOR ASPHALT SURFACES
SS-109 DATE: 1/11/13 SCALE: NTS

REV.	DATE	SURVEYED	ENGINEERED	DRAWN	CHECKED	APPROVED
	7/24/2024	n/a	JK	BJG/JK		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

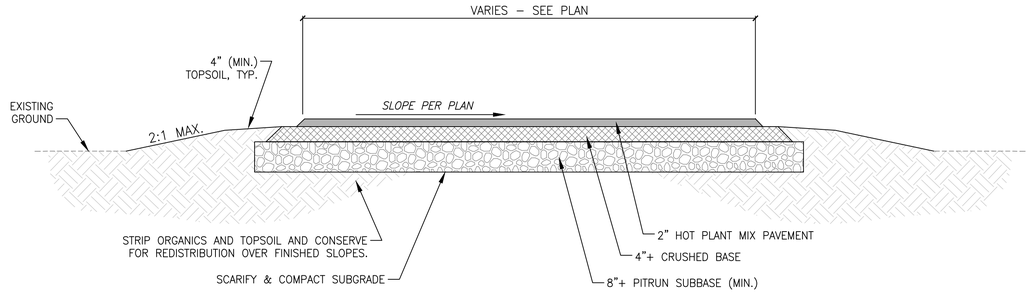
DRAWING TITLE: UTILITY DETAILS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL HOUSE TOWN OF JACKSON, WY

DRAWING NO: C2.0

JOB NO: 23-302-02

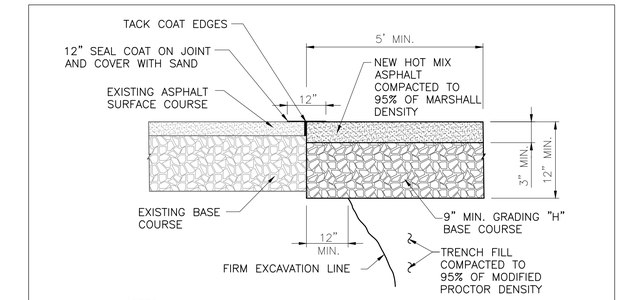
S:\Proj\2023\302-02 (tcj) High school rd water supply facilities\X4 drawings\CivilVSR XMYWELL 9 & 10 DETAILS.dwg (UTILITY DETAILS) - Apr 09 2025 115512 am PLOTTED BY: green DWG FORMAT: 25.0



NOTES:
1. COMPACT ALL NATIVE AND IMPORTED NON–BITUMINOUS MATERIALS TO 95% MAXIMUM DENSITY AS DETERMINED BY ASTM D698.
2. COMPACT ASPHALT IN LIFTS NOT TO EXCEED 2–INCHES IN THICKNESS. COMPACT TO 95% OF MARSHALL DENSITY.

1 / C2.1 **PUMP HOUSE DRIVEWAY & PARKING TYPICAL SECTION**

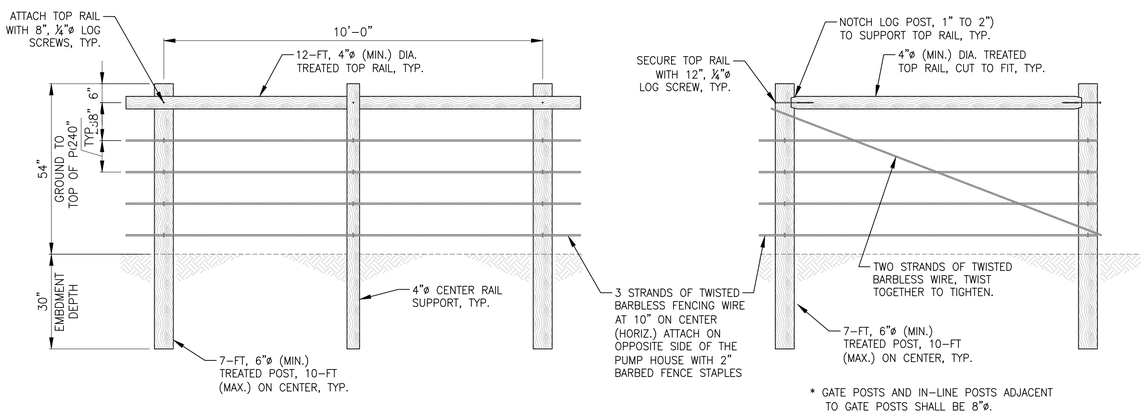
Scale: N.T.S.



NOTES:
1. BITUMINOUS MATERIAL SHALL MEET THE APPLICABLE REQUIREMENTS OF SECTION 02545. BITUMINOUS MATERIALS OF WYOMING PUBLIC WORKS STANDARDS AND SPECIFICATIONS
2. REPLACEMENT ASPHALT THICKNESS SHALL BE 1" GREATER THAN EXISTING AND NO LESS THAN 3" MINIMUM.
3. ASPHALT SHALL BE PLACED IN TWO (2) LIFTS, EACH NO LESS THAN 1½" IN THICKNESS, AND COMPACTED TO 95% OF MARSHALL DENSITY.

ST-118 / C2.1 **ASPHALT PATCH REPAIR SECTION**

ST–118 **DATE:** 12/5/12 **SCALE:** NTS



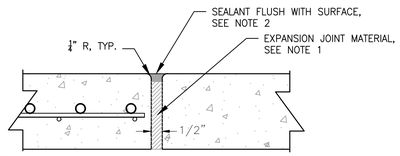
FENCE DETAIL

CORNER AND GATE H-BRACE DETAIL

* GATE POSTS AND IN–LINE POSTS ADJACENT TO GATE POSTS SHALL BE 8"ø.

2 / C2.1 **TYPICAL FENCE DETAILS**

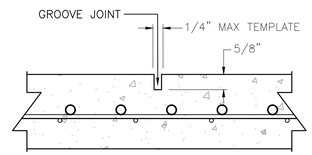
Scale: N.T.S.



NOTE:
1. EXPANSION JOINT MATERIAL: ½" PREMOLDED NON–EXTRUDING EXPANSION JOINT MATERIAL TO MEET AASHTO M–59, ASTM D1751 OR D1752. EXPANSION MATERIAL SHALL BE INSTALLED WHEN ABUTTING EXISTING CONCRETE OR FIXED STRUCTURES SUCH AS INLETS AND DRIVEWAYS, AND ON LONG STRAIGHT CONCRETE STRETCHES.
2. SEALANT: POLYURETHANE, SEALANT, US FEDERAL SPECIFICATION TT–S–00230C, TYPE II, CLASS A, ASTM C920 TYPE S, GRADE NS, CLASS 25.

3 / C2.1 **EXPANSION JOINT**

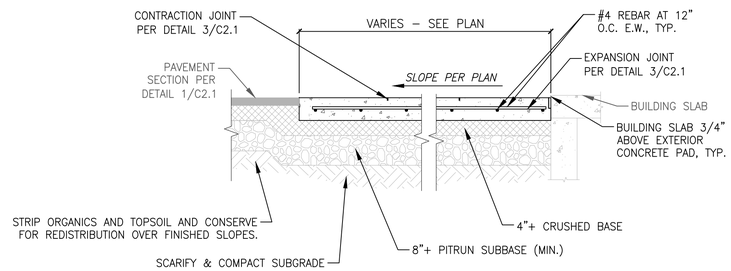
Scale: N.T.S.



NOTE:
1. COMPLETE SAW CUTTING AS SOON AS CONCRETE IS HARDENED SUFFICIENTLY TO PERMIT SAWING WITHOUT EXCESSIVE RAVELING AND BEFORE UNCONTROLLED CRACKING OCCURS. MAXIMUM DISTANCE BETWEEN JOINTS IS 5' (MAX.) EACH WAY ON CONCRETE PADS.

4 / C2.1 **CONTROL/CONTRACTION JOINT (SAW-CUT)**

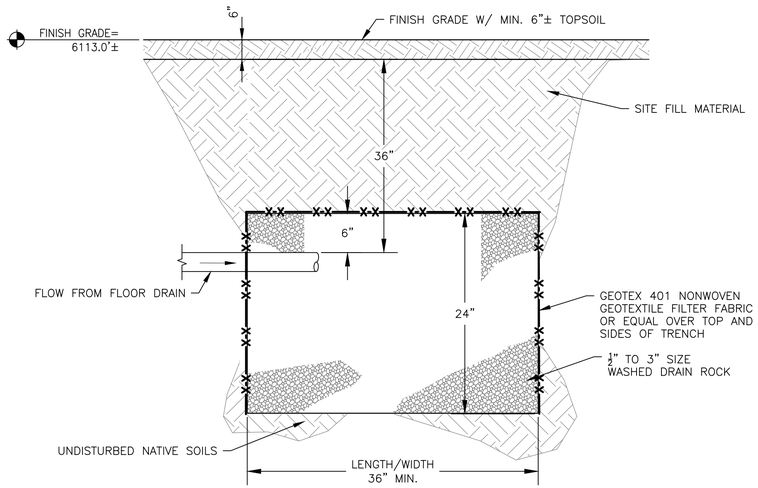
Scale: N.T.S.



NOTES:
1. COMPACT ALL NATIVE AND IMPORTED NON–BITUMINOUS MATERIALS TO 95% MAXIMUM DENSITY AS DETERMINED BY ASTM D698.
2. COMPACT ASPHALT IN LIFTS NOT TO EXCEED 2–INCHES IN THICKNESS. COMPACT TO 95% OF MARSHALL DENSITY.

A / C2.1 **CONCRETE PAD DETAIL**

Scale: N.T.S.



5 / C2.1 **DRY WELL DETAIL**

SCALE: NTS

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733–2087

REV.		
DATE	7/24/2024	
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

DRAWING TITLE: **UTILITY DETAILS**

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL HOUSE TOWN OF JACKSON, WY

DRAWING NO: **C2.1**

JOB NO: **23–302–02**

S:\Proj\2023\302-02 (tu) high school rd water supply facilities\4 drawings\Civil\WSR WHVWELL 9 & 10 DETAILS.dwg 6UTILITY DETAILS-2D - May 05 2025 08:37:59 pm PLOTTED BY: jgreen DWG FORMAT: 25D

ABBREVIATIONS

ADJ.	Adjustable/ Adjacent	MAX.	Maximum
A.F.F.	Above Finish Floor	MECH.	Mechanical
ALT.	Alternate	MEMB.W.P.	Membrane Waterproofing
ALUM.	Aluminum	MFR.	Manufacturer
APPROX.	Approximate	MIN.	Minimum
ARCH.	Architectural/Architect	MISC.	Miscellaneous
		M.O.	Masonry Opening
BD.	Board	MTL.	Metal
BLDG.	Building		
B.M.	Bench Mark	(N)	New
B.O.	Bottom Of	NEC.	Necessary
BRG.	Bearing	N.I.C.	Not in Contact
BSMT.	Basement	NOM.	Nominal
BTM.	Bottom	N.T.S.	Not to Scale
CAB.	Cabinet	O.A.F.	Overall Frame
CLG.	Ceiling	O.C.	On Center
CLO.	Closet	O.D.	Outside Diameter
C.M.	Construction Manager	OPNG.	Opening
C.M.U.	Concrete Masonry Unit	OPP.	Opposite
COL.	Column	OPP.H.	Opposite Hand
CONC.	Concrete	ORIG.	Original
CONST.	Construction Joint		
CONT.	Continuous	PL.	Plate
CONTR.	Contractor	P.LAM.	Plastic Laminate
COORD	Coordinate	PLAS.	Plaster
C.T.	Ceramic Tile	PLYWD.	Plywood
CTR.	Center	PREFAB.	Prefabricated
C.W.	Cold Water	PTD.	Painted
DBL.	Double	RAD.	Radius
DET.	Detail	R.D.	Roof Drain
DIA.	Diameter	RECMND.	Recommendation
DIM.	Dimension	REF.	Reference
DISP.	Dispenser/Disposal	REINF.	Reinforce/ing
DN.	Down	REQ'D.	Required
D.P.	Dampproofing	REV.	Revisions
D.H.	Drainable Housewrap	RM.	Room
DWG.	Drawing	R.O.	Rough Opening
		RTG.	Rating
EA.	Each		
E.C.	Electrical Contractor	S.C.	Solid Core
EL.	Elevation	SCHED.	Schedule
ELEC.	Electrical/ Electric	SECT.	Section
ELEV.	Elevator/ Elevation	S.F.	Square Feet
E/O.	Equipment by Owner	SHT.	Sheet
EQ.	Equal	SHTG.	Sheathing
EQUIP.	Equipment	SIM.	Similar
EXIST. or (E)	Existing	SPECS.	Specifications
EXT.	Exterior	SQ.	Square
		S.S.	Stainless Steel
F.D.	Floor Drain	STL.	Steel
FDN.	Foundation	STOR.	Storage
F.E.	F.E. Fire Extinguisher	STRUCT.	Structural
FIN.	Finish	SUSP.	Suspended
FLR.	Floor	S.S.D.	See Structural Drawings
F.O.S.	Face of Stud	S.C.D.	See Civil Drawings
FR.	Frame	S.M.D.	See MEP Drawings
FT.	Feet/Foot	S.A.T.	See Assembly Types
FTG.	Footing		
FURR.	Furring	TEL.	Telephone
		TEMP.	Tempered
GA.	Gauge	T.O.	Top Of
GALV.	Galvanized	TOIL.	Toilet
G.C.	General Contractor	TRTD.	Treated
GYP. BD.	Gypsum Board	TYP.	Typical
H.B.	Hose Bibb	U.G.	Underground
HDCP.	Handicapped	U.L.	Underwriters Laboratory
H.C.	Hollow Core	UNEXC.	Unexcavated
H.M.	Hollow Metal	UNFIN.	Unfinished
HORZ.	Horizontal	U.O.N.	Unless Otherwise Noted
HT.	Height		
H.W.	Hot Water	VERT.	Vertical
		V.I.F.	Verify In Field
I.D.	Inside Diameter	V.T.R.	Vent Through Roof
IN.	Inch/Inches		
INSUL.	Insulation	W/	With
INT.	Interior	W.C.	Water Closet
INV.	Invert	WD.	Wood
		WIN.	Window
JAN.	Janitor	W.P.	Waterproof
JT.	Joint	W.W.F.	Welded Wire Fabric
		W.R.B.	Weatherproof Building Wrap
LOC.	Location		

SYMBOL LEGEND

1 View Name 1/8" = 1'-0"	Drawing Title
SIM 1 A101	Section Tag
1 A101	Exterior Elevation Tag
1 A101 1	Interior Elevation Tag
Name Elevation	Elevation Datum
	North Arrow
SIM 1 A101	Detail Key
0	Grid Tag
101	Door Tag
1t	Window Tag
	Spot Elevation Tag
Room name	Room Tag
	Centerline Tag

GENERAL CONSTRUCTION NOTES:

1. THE TERM "OWNER" SHALL DENOTE THE CLIENT, OR OWNER, AS DESIGNATED IN THE CONTRACT. THE TERM "GENERAL CONTRACTOR" OR "CONTRACTOR" SHALL DENOTE THE CORPORATION, COMPANY, PARTNERSHIP, FORM OR INDIVIDUAL WHO HAS ENTERED INTO THE CONTRACT FOR THE PERFORMANCE OF THE WORK AND HAS ENGAGED SUBCONTRACTORS TO PERFORM A PART OF THE WORK. THE TERM "ARCHITECT" REFERS TO ATELIER 43, LLC. THE USE OF THE WORDS "PROVIDE" AND "PROVIDED" IN CONNECTION WITH ANY ITEM SPECIFIED SHALL BE INTENDED TO MEAN THAT THE ITEM SHALL BE FURNISHED, INSTALLED AND CONNECTED WHERE SO REQUIRED.
2. THIS PROJECT SHALL COMPLY WITH THE CURRENT ADOPTED INTERNATIONAL RESIDENTIAL CODE, IMC, IFC, INTERNATIONAL URBAN/ WILDLAND INTERFACE CODE AND THE CURRENTLY ADOPTED NATIONAL ELECTRIC CODE, THE CCR'S OF THE SUBDIVISION IN WHICH THE PROJECT IS LOCATED AND THE CURRENT TETON COUNTY COMPREHENSIVE PLAN AND LAND DEVELOPMENT REGULATIONS, INCLUDING ALL AMENDMENTS. ANY BUILDING OFFICIAL, SUBCONTRACTOR OR TRADES PERSON NOTING DISCREPANCIES SHALL NOTIFY ARCHITECT IMMEDIATELY UPON THEIR DISCOVERY.
3. CONTRACTOR SHALL COORDINATE ALL REQUIRED INSPECTIONS BY TETON COUNTY BUILDING AND FIRE DEPARTMENTS, LOCAL ELECTRICAL INSPECTOR AND OTHER GOVERNING AUTHORITIES.
4. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL TEMPORARY UTILITIES, INCLUDING ELECTRICITY NECESSARY FOR CONSTRUCTION AND TEMPORARY SEPTIC FACILITIES, WHICH SHALL BE MAINTAINED ON SITE FOR DURATION OF CONSTRUCTION. A JOB PHONE MUST BE MAINTAINED ON SITE FOR DURATION OF CONSTRUCTION AND THE PHONE NUMBER WILL BE MADE AVAILABLE TO THE ARCHITECT.
5. ALL CONSTRUCTION DEBRIS TO BE STOCKPILED NEATLY ON SITE UNTIL DISPOSAL, WHICH SHALL BE DONE AT COUNTY LANDFILL OR RECYCLING FACILITY ONLY. NO DEBRIS IS TO BE DISPOSED OF IN LOCAL WASTE COLLECTION FACILITIES. ON SITE REFUSE BURNING WILL BE DONE ONLY WITH APPROVAL OF OWNER, TETON COUNTY SHERIFF AND THE SUBDIVISION HOMEOWNER'S ASSOCIATION.
6. CONTRACTOR SHALL INFORM ARCHITECT OF ANY AND ALL OWNER REQUESTED CHANGES OR DIRECTIVES FOLLOWING OWNER/CONTRACTOR CONVERSATIONS. CONTRACTOR SHALL NOT PROCEED WITH OWNER REQUESTED CHANGES OR DIRECTIVES WITHOUT PRIOR REVIEW FROM THE ARCHITECT AND WRITTEN CHANGE ORDER.
7. EXCEPT AT INTERIOR ELEVATIONS, AND UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE GIVEN TO FACE OF ROUGH FRAMING, CENTERLINE OF COLUMNS, OR FACE OF CONCRETE AND C.M.U.WALL. INTERIOR ELEVATION DIMENSIONS ARE GIVEN TO FACE OF FINISH MATERIAL. GIVEN DIMENSIONS TAKE PRECEDENCE OVER SCALE. CONTRACTOR SHALL TAKE EXTRA CAUTION TO COORDINATE DIMENSIONS OF STRUCTURAL DRAWINGS WITH ARCHITECTURAL DRAWINGS PRIOR TO CONSTRUCTION. VERIFY DISCREPANCIES WITH ARCHITECT.
8. CONTRACTOR SHALL PROVIDE STORAGE FOR ALL BUILDING MATERIALS IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
9. SOLID WOOD BLOCKING, INSULATION OR OTHER FIRESTOP MATERIAL IS TO BE PROVIDED BETWEEN STORIES, BETWEEN TOP STORY AND ROOF SPACE, BETWEEN STAIR STRINGERS AT TOP AND BOTTOM, BETWEEN STUDS ALONG STAIR RUNS AND AT ALL OTHER PLACES THAT COULD AFFORD THE PASSAGE OF FLAME, AS REQUIRED BY THE IRC.
10. G.C. TO PROVIDE SAMPLES OF ALL FINISHES AND STAIN COLORS FOR APPROVAL BY ARCHITECT / OWNER. THIS INCLUDES INTERIOR AND EXTERIOR STAINS, INTERIOR PAINT, SHEETROCK TEXTURES, ETC.- SEE PROJECT MANUAL.
11. THE CONTRACTOR, SUBCONTRACTOR, SUPPLIER OR OTHER HIRED ENTITY SHALL ALIGN ALL VISIBLE PRODUCTS / EQUIPMENT (WHICH INCLUDES BUT IS NOT LIMITED TO, OUTLETS, LIGHTS, SWITCHES, SMOKE DETECTORS, THERMOSTATS, AV DEVICES, DIFFUSERS, FIRE PROTECTION, ETC.) EQUALLY BETWEEN OR DIRECTLY WITH ARCHITECTURAL ELEMENTS (WINDOWS, DOORS, BEAMS, COLUMNS ETC.) AND OTHER VISIBLE PRODUCTS / EQUIPMENT. ADJUST STRUCTURAL FRAMING AS REQUIRED (CONTACT ARCHITECT PRIOR TO ADJUSTING FRAMING FOR POSSIBLE STRUCTURAL REQUIREMENTS). VERIFY ALL LOCATIONS WITH ARCHITECT PRIOR TO ROUGH-IN INSTALLATIONS OF ANY SYSTEM OR EQUIPMENT. ANY ADJUSTMENTS IN THE FIELD PER ARCHITECT'S DIRECTION MAY BE REQUIRED AND SHALL BE INCLUDED IN THE PROJECT COSTS.
12. PROVIDE 4" DIAMETER, SCHEDULE 30 P.V.C PIPE LABELED "RADON VENT", CONTINUOUS FROM CRAWL SPACE GRAVEL BED TO RAIN CAP TERMINUS ABOVE ROOF. RADON VENTS SHALL BE PLACED SO THAT THE A FUTURE FAN MAY BE INSTALLED IF NECESSARY, PROVIDE RECEPTACLE IN ATTIC NEAR PIPE.
13. ALL VENT PIPES THAT EXTEND THROUGH THE ROOF SHALL BE TERMINATED 16" MIN. ABOVE THE ROOF.
14. FIRE SPRINKLER SYSTEM TO MEET NFPA 13 OR NFPA13R WHERE REQUIRED. SIZING AND INSTALLATION TO BE DONE BY LICENSED FIRE SPRINKLER CONTRACTOR. SEE FIRE PROTECTION DRAWINGS.
15. METAL FLASHING, METAL VENTS, METAL UTILITY CASING, METAL SIDING, EXTERIOR WINDOW CLADDING, EXTERIOR METAL DOORS, AND ANY OTHER PAINTED EXTERIOR METAL SHALL MATCH IN COLOR.

SITE NOTES:

1. PRELIMINARY AND FINAL BUILDING STAKING TO BE VERIFIED IN FIELD BY ARCHITECT PRIOR TO EXCAVATION.
2. FINAL BUILDING STAKING AND ALL REQUIRED SURVEYING TO BE PERFORMED BY LICENSED SURVEYOR AT CONTRACTOR'S EXPENSE
3. CONTRACTOR TO NOTIFY ARCHITECT OF ANY PROBLEMS WITH EXISTING SOIL CONDITIONS OR HIGH WATER TABLE IMMEDIATELY UPON DISCOVERY. (PRIMARILY DURING EXCAVATION)
4. ALL NECESSARY PIT RUN OR ROAD BASE MATERIAL, IMPORTED FOR THE CONSTRUCTION OF DRIVEWAY, SHALL BE FIGURED INTO THE COST OF THE GENERAL CONSTRUCTION CONTRACT. EXCESS FILL EXCAVATED FOR THE HOUSE FOUNDATION, AND NOT USED FOR SLOPED GRADE AT BUILDING PERIMETER AS SHOWN AT BUILDING SECTIONS AND SITE PLAN, MAY BE USED IN THE CONSTRUCTION OF THE DRIVEWAY. THE UNIT COST OF ANY ADDITIONAL IMPORTED PIT RUN AS MAY BE REQUIRED TO PROVIDE BEARING FOR FOOTINGS SHALL BE CLEARLY INDICATED IN THE PROPOSAL / CONTRACT AS A POTENTIAL ADDITIONAL COST.
5. CONTRACTOR IS RESPONSIBLE FOR PROVIDING, COORDINATING AND SUPERVISING THE TRENCHING OF UTILITIES AND SERVICES TO AND FROM BUILDING. COORDINATION SHALL INCLUDE CONTRACTOR'S REASONABLE EFFORTS TO COMBINE AS MANY DIFFERENT UTILITIES IN COMMON TRENCHES AS PRACTICALITIES AND GOOD PRACTICE PERMIT.
6. ALL SITE MATERIALS SHALL BE COMPACTED IN 6" TO 8" LIFTS, UNLESS OTHERWISE NOTED, TO PREVENT SETTLING OF FINISH GRADE, WALKS, DRIVEWAYS, TERRACES, ETC.
7. REMOVAL OF EXISTING TREES AND OTHER ORGANIC MATERIAL CLEARED FOR THE PURPOSE OF CONSTRUCTION IS THE RESPONSIBILITY OF THE CONTRACTOR.
8. EXCAVATED TOP SOIL IS TO BE RETAINED AND USED AS FINAL GROUND COVER. ALL DISTURBED AREAS, INCLUDING ROUGH GRADING AT BUILDING PERIMETER AND UTILITY TRENCHES ARE TO BE COVERED WITH TOP SOIL. TOP SOIL SHALL BE DEFINED AS MIN 4" DEEP, FREE OF DEBRIS, WASTE, FROZEN MATERIAL, VEGETATION OR OTHER DELETERIOUS MATTER AND CONTAINING NOT MORE THAN 10% SAND, GRAVEL, CLAY OR ROCKS - NONE OF WHICH MAY BE LARGER THAN 1" IN ANY DIRECTION.
9. CONTRACTOR TO PROVIDE FINISH GRADING TO MATCH SPOT ELEVATIONS AS SHOWN AT FLOOR PLAN. FINISH GRADE TO BE SMOOTH EVEN SURFACE WITH RAKED FINISH TO BLEND NATURALLY WITH UNDISTURBED EXISTING GRADE.
10. MINIMUM SLOPE AWAY FROM HOUSE SHALL BE 1/8" PER FOOT.
11. FINISH LANDSCAPING (INCLUDING SEEDING AND PLANTING OF NEW TREES) IS NOT PART OF THIS CONTRACT.
12. CUTTING AND PATCHING OF ROADWAYS TO PROVIDE HOOKUP ARE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.
13. LOCATION OF ALL UTILITIES TO BE VERIFIED WITH ARCHITECT. GRAVEL DRIVE AND PARKING TO BE CONSTRUCTED OF MIN 4" OF ¾" CRUSHED GRAVEL OVER MIN 6" OF ROAD BASE (PIT RUN OR FILL EXCAVATED FROM THE SITE MAY BE USED IF OF PROPER COMPOSITION). ELEVATE ABOVE SURROUNDING GRADE AND CROWN TO PROVIDE POSITIVE DRAINAGE.
14. REMOVE ALL TOP SOIL BELOW DRIVE PRIOR TO INSTALLATION AND FEATHER INTO SIDE OF ELEVATED FINISH DRIVE.
15. ALL EXCAVATED FILL AND DEMOLITION DEBRIS IS TO BE STOCKPILED IN THE AREAS DESIGNATED ON THE SITE PLAN.
16. SEE SITE GRADING PLAN FOR PROPOSED DRIVE AND PARKING AREA LOCATIONS AND CONSTRUCTION SPECIFICATIONS.
17. SEE SITE GRADING PLAN FOR UTILITY SPECIFICATIONS FOR INSTALLATION.

SITE CALCULATIONS

SITE INFORMATION

GROSS SITE AREA:	39.32 ACRES
ADJUSTED SITE AREA:	38.30 ACRES
ZONING:	R-1
ZONING OVERLAYS:	SRO

ZONING SUMMARY:

MINIMUM LSR	N/A
MIN. STREET YARD	EXEMPT
MIN. SIDE YARD	EXEMPT
MIN. REAR YARD	EXEMPT
MIN. IRRIGATION DITCH	EXEMPT
MAX. HEIGHT	37.5' (30' STREET ELEVATION)

FLOOR AREA OF PROPOSED STRUCTURE

MAX. ALLOWED	11,907 SF
MAX. SINGLE BUILDING	10,000 SF
PROPOSED	1,302 SF

VICINITY MAP

N.T.S.

PROJECT INFORMATION

PROJECT DESCRIPTION:	ToJ HIGH SCHOOL ROAD PUMP HOUSE JOB #2317 PT. LOT 6 SEC. 6, TWP. 40, RNG. 116 HEREFORD RANCH TRACT 1A
PROJECT OWNER:	TOWN OF JACKSON 450 W Snow King Ave Jackson, WY 83001 (307) 739-4547 btlenz@jacksonwy.gov
PROJECT ARCHITECT:	CHRIS JAUBERT ATELIER 43, LLC 610 W BROADWAY STE 103, JACKSON, WY, 83001 307.249.8650
CONTRACTOR:	

PROJECT SUMMARY

WORK DESCRIPTION: THE PROJECT CONSISTS OF THE CONSTRUCTION OF A NEW 1,302 SF WATER TREATMENT FACILITY WITH AN ON-SITE WELL, PUMP STATION CONTROL ROOM, CHLORINE SANITATION ROOM, AND GENERATOR ROOM.

TYPE VB CONSTRUCTION

SPRINKLERED? - YES

GOVERNING CODES:
2021 INTERNATIONAL RESIDENTIAL CODE
2021 INTERNATIONAL ENERGY CONSERVATION CODE
2021 INTERNATIONAL FIRE CODE AND INTERNATIONAL WILDLAND URBAN INTERFACE CODE
2021 INTERNATIONAL MECHANICAL CODE
2021 INTERNATIONAL PLUMBING CODE
2021 INTERNATIONAL FUEL GAS CODE
2020 NATIONAL ELECTRIC CODE

JACKSON HOLE FIRE / EMS

40 East Pearl Avenue
PO Box 901
Jackson, WY 83001

February 4, 2025

Parcel 22-40-16-06-3-00-023
Wildland Urban Interface Review

The property above is within the Wildland Urban Interface zone and requires review under the 2024 Edition of the International Wildland Urban Interface Code. A review of the hazard rating shows the area scores below moderate fire hazard rating.

***All driveway conditions must be approved by the County Engineering Department.*

Requirements of the code are as follows:

1. **Driveways** in excess of 150 feet shall be provided with turnaround. Driveways in excess of 200 feet and less than 20 feet in width shall be provided with turnouts in addition to turnarounds. Driveways shall provide a minimum unobstructed width of 12 feet and unobstructed height of 13 feet 6 inches. Turnarounds shall have inside turning radii of not less than 30 feet and outside turning radii of not less than 45 feet. Turnouts shall be all-weather road surface at least 10 feet wide and 30 feet long. (IWUIC 403.2)
2. **Firewood and combustible material** shall not be stored in unenclosed spaces beneath buildings or structures, or on decks or under eaves, canopies or other projections or overhangs. (IWUIC 607.1)
3. **Chimneys** serving fireplaces, barbecues, incinerators, or decorative heating appliances in which solid or liquid fuel is used, shall be provided with a spark arrester. Arrester shall be constructed of woven or welded wire screening of 12 gage wire having openings not exceeding ½ inch. (IWUIC 603.2, 605.1)
4. **LP-gas containers** shall be installed underground. (IWUIC 606.2; amended)
5. **Fuel modification** distance shall not be less than 30 feet or to the lot line, whichever is less. Trees are allowed within the defensible space provided that the distance between the crowns of adjacent trees, overhead electrical facilities and structures is not less than ten feet. (IWUIC 603.2/ 603.2.2) Trees within the defensible space must be pruned to remove limbs located within 6' of the ground surface. Maintenance of required defensible space shall be in accordance with IWUIC 604.
6. All buildings shall have a **permanently posted address,** which shall be placed at each driveway entrance and be visible from **both directions of travel along the road.** Where multiple addresses are required at a single driveway, they shall be mounted on a single post and additional signs shall be posted at locations where driveways divide. (IWUIC 403.6)

Please feel free to contact me if you have further questions.

At Your Service,

Bobbi Clauson

307-733-4732 (p) | 307-739-9856 (f) | jhfire-ems.org

SERVICE • COLLABORATION • ACCOUNTABILITY • EXCELLENCE • POSITIVITY • INNOVATION

DRAWING LIST

Sheet No.	Sheet Name
GENERAL	
G1.0	COVER
G1.1	SCHEDULES
G1.2	WALL, FLOOR, AND ROOF TYPES
G1.3	CODE ANALYSIS
ARCHITECTURAL	
A1.0	FOUNDATION PLAN
A1.1	FLOOR PLAN
A1.2	ROOF PLAN
A3.1	BUILDING ELEVATIONS
A3.2	BUILDING ELEVATIONS
A4.1	BUILDING SECTIONS
A5.1	WALL SECTIONS / DETAILS
A5.2	WALL SECTIONS / DETAILS

Revisions #	Description	Date

Drawing Title COVER

Date 2025.07.29

Mechanical: Energy 1 David Magill 5300 South Park Drive Jackson, WY 83001 307.200.2210

Civil: Nelson Engineering Josh Kilpatrick 450 S. Cache St. Jackson, WY 83001 307.733.2087

Structural: Nelson Engineering Carli Hansen 450 S. Cache St. Jackson, WY 83001 307.733.2087

Client: TOWN OF JACKSON

Project: TOJ HIGH SCHOOL ROAD PUMP HOUSE

Architect: Atelier 43, LLC mail PO Box 4055 Jackson, WY 83001 office 610 W Broadway Ave #103 Jackson, WY 83001 phone 307.249.8650

G1.0

WINDOW SCHEDULE:

Mark	Manufacturer	Model	Unit Size		Head Height	Count	Comments
			Width	Height			
A	T.B.D.	Standard Fixed Window Unit	3' - 0"	1' - 8"	8' - 0"	6	
B	T.B.D.	Standard Fixed Window Unit	3' - 0"	3' - 0"	6' - 8"	1	60-MINUTE FIRE RATED, ASTM E119 or UL 263 LISTED, SHATTER-RESISTANT GLASS

WINDOW NOTES:

1. ALL WINDOWS BRAND TO BE DETERMINED
2. ALL WINDOWS TO BE .30 U-FACTOR OR BETTER
3. EXTERIOR FINISH COLOR TO BE DETERMINED
4. INTERIOR FINISH WOOD TO BE DETERMINED
5. INTERIOR TRIM TO BE PAINTED WOOD - SEE DETAILS
6. HARDWARE FINISH TO BE DETERMINED
7. GC TO PROVIDE SAMPLE TO CONFIRM COLOR SELECTION. SEE EXTRIOR ELEVATIONS FOR OPERATION.
8. ALL WINDOWS TO BE MANUFACTURED FOR HIGH ALTITUDE USE.
9. VERIFY ALL EGRESS WINDOWS.
10. VERIFY ALL TEMPERED WINDOWS -
    -ALL WINDOWS LOCATED WITHIN 24" HORIZONTALLY OF DOORS AND LESS THAN 60" AFF.
    -ALL WINDOWS WITH NET GLAZING AREA THAT IS GREATER THAN 9 SQUARE FEET AND ARE LESS THAN 18" AFF UNLESS UNINTERRUPTED BY STRUCTURAL HORIZONTAL MEMBERS FROM 34" TO 38" AFF.
    -IN ALL TUB AND SHOWER ENCLOSURES.
    -IN ANY WINDOW LOCATED AT A STAIRWAY LANDING ENCLOSURE AND ANY WINDOW LOCATED WITHIN 60" OF THE TOP OR BOTTOM OF A STAIRWAY IF THE BOTTOM OF THE GLAZING IS LESS THAN 36" AFF.
    -IN ALL DOORS.
    -GLAZING WITHIN 24" OF THE HINGE-SIDE OF AN IN-SWINGING DOOR.
    -GLAZING IN WALLS, ENCLOSURES OR FENCES CONTAINING OR ADJACENT TO BATHTUBS OR SHOWERS WHERE THE BOTTOM EDGE OF THE GLAZING IS LESS THAN 60" ABOVE THE STANDING OR WALKING SURFACE.

DOOR SCHEDULE:

Door Number	Width	Height	Door Type	Function	Hardware Group	Comments
001	9' - 0"	9' - 10"	THERMISER® INSULATED ROLLING DOOR	Exterior		
002	3' - 0"	6' - 8"	HOLLOW METAL DOOR	Exterior	A	
003	3' - 0"	6' - 8"	HOLLOW METAL DOOR	Exterior	A	
004	7' - 0"	9' - 10"	THERMISER® INSULATED ROLLING DOOR	Exterior		
005	2' - 10"	6' - 8"	HOLLOW METAL DOOR	Interior	B	
006	10' - 0"	9' - 10"	THERMISER® INSULATED ROLLING DOOR	Exterior		WITH VISION WINDOWS

DOOR NOTES:

1. ALL DOORS TO BE .30 U-FACTOR OR BETTER
2. EXTERIOR ENTRY DOORS TO BE SAME BRAND/SERIES AS WINDOWS.
3. DOOR HARDWARE TO BE DETERMINED.
4. LEVER HANDLE, HINGES, AND DOOR STOP MATERIAL TO BE DETERMINED.
5. ALL CLOSET DOORS TO BE 1 3/8" THICK, SOLID CORE, BIRCH VENEER, FLAT PANEL.
6. VERIFY ALL TEMPERED GLASS.

DOOR HARDWARE LEGEND:

TYPE A
PULL SIDE - LEVER WITH KEYED LOCK
PUSH SIDE - PANIC BAR w/ CONCEALED VERTICAL ROD

TYPE B
PULL SIDE - PASSAGE LEVER
PUSH SIDE - PANIC BAR w/ CONCEALED VERTICAL ROD

Revisions

#	Description	Date

Drawing Title
SCHEDULES

Date
2025.07.29

Mechanical:
Energy 1
David Magill
5301 Skyway Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carli Hansen
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

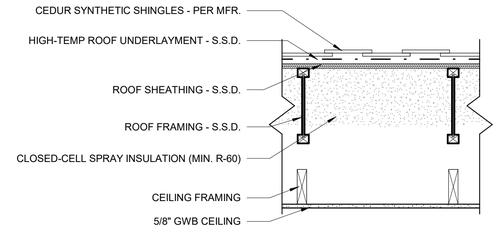
Client:
TOWN OF JACKSON

Project:
TOJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

G1.1

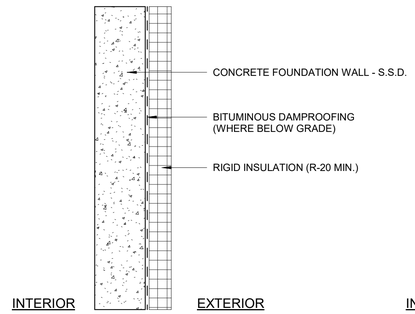
ROOF/CEILING TYPES



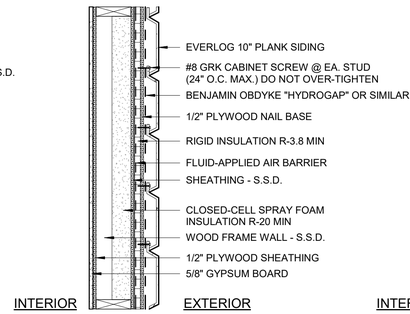
R-1 ROOF
MIN. R-60

NOTE:
-CLASS A ROOFING

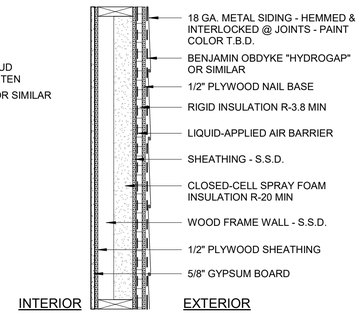
WALL TYPES



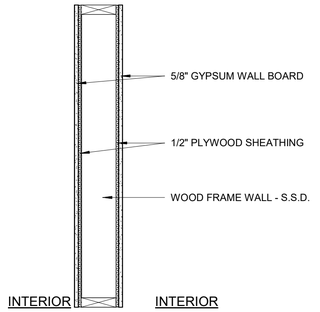
1 FOUNDATION WALL
FOUNDATION WALL W/ RIGID INSULATION



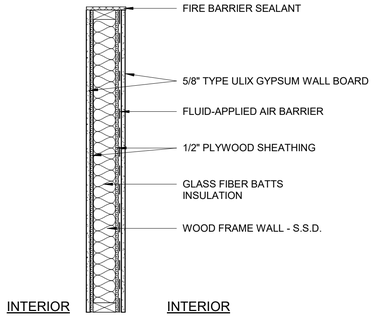
2 EXTERIOR FRAMED WALL
W/ WOOD STUD
WIDTH VARIES



3 EXTERIOR FRAMED WALL
W/ 2x6 WOOD STUD
WIDTH VARIES

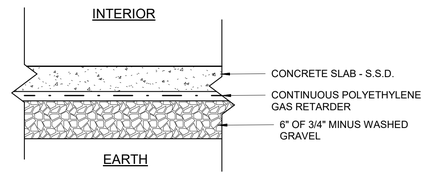


4 INTERIOR FRAMED WALL
STUD WIDTH PER PLAN



5 FIRE BARRIER WALL
STUD WIDTH PER PLAN
1-HR. RATED
REF. U303

FLOOR TYPES



S-1 SLAB FLOOR

NOTE:
-SLOPE CONCRETE SLAB TO DRAINS (SEE FLOOR PLANS)
-PROVIDE SUB-SLAB CONTINUOUS PERIMETER RADON VENT CONNECTED TO VERTICAL VENT PIPE. VERTICAL VENT PIPE TO BE TERMINATED AT ROOF. PROVIDE OUTLET AT ROOF FOR FUTURE IN-LINE FAN.
-GAS RETARDER TO BE MECHANICALLY ATTACHED TO FOUNDATION WALL PERIMETER AND SEALED. ALL JOINTS AND PENETRATION TO BE TAPED IN SEALED.

Revisions

#	Description	Date

Drawing Title
WALL, FLOOR, AND ROOF TYPES

Date
2025.07.29

Mechanical:
Energy 1
David Magel
5300 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

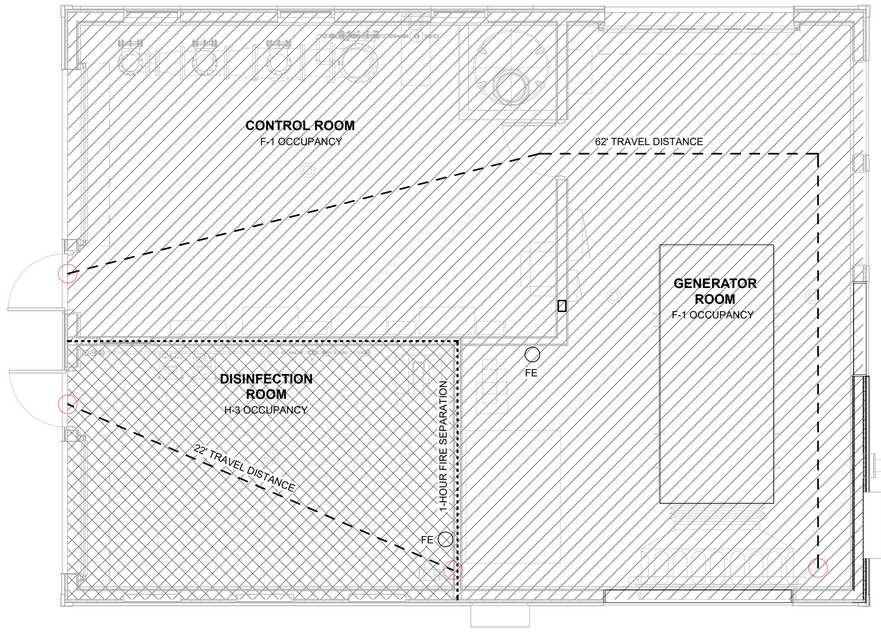
Client:
TOWN OF JACKSON

Project:
Tol HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

OCCUPANCY SCHEDULE

NAME	AREA	OCCUPANCY	OCCUPANT FACTOR	TOTAL OCCUPANTS	REQUIRED EGRESS WIDTH
FACTORY	1021 SF	F-1	300 GROSS	3	32"
HIGH HAZARD	281 SF	H-3	300 GROSS	1	32"



1 FLOOR PLAN - CODE PLAN
1/4" = 1'-0"

CODE REVIEW

APPLICABLE CODES:
2021 INTERNATIONAL RESIDENTIAL CODE
2021 INTERNATION ENERGY CONSERVATION CODE
2021 INTERNATIONAL FIRE CODE AND INTERNATIONAL WILDLAND URBAN INTERFACE CODE
2021 INTERNATIONAL MECHANICAL CODE
2021 INTERNATIONAL PLUMBING CODE
2021 INTERNATIONAL FUEL GAS CODE
2020 NATIONAL ELECTRIC CODE

OCCUPANCY | IBC CHAPTER 3:
TYPE F-1 - FACTORY (1,021 SQ. FT.)
TYPE H-3 - HIGH HAZARD (281 SQ. FT.)

OCCUPANCY LOAD:
SEE OCCUPANCY SCHEDULE
TOTAL: **4 OCCUPANTS**

BUILDING HEIGHT AND AREA | IBC CHAPTER 5:
BUILDING HEIGHT V-B (TABLE 504.3) ALLOWABLE = 40'
ACTUAL = 16'-5"

NUMBER OF STORIES (TABLE 504.4) ALLOWABLE = 1 STORY
ACTUAL = 1 STORY

AREA PER STORY (TABLE 506.2) ALLOWABLE = 5,000 SF
ACTUAL = EXISTING NO CHANGE

SEPARATION OF OCCUPANCIES (TABLE 508.4):
F-1/H-3 SPRINKLED: **1-HR**

CONSTRUCTION TYPE | IBC CHAPTER 6:
CONSTRUCTION TYPE: **TYPE V-B**

STRUCTURAL FRAME	0 HR
BEARING WALLS	
EXTERIOR	0 HR
INTERIOR	0 HR
NON-BEARING WALLS	
EXTERIOR	0 HR
INTERIOR	0 HR
FLOOR CONSTRUCTION	0 HR
ROOF CONSTRUCTION	0 HR

FIRE SPRINKLER AND FIRE ALARM | IBC CHAPTER 9:
FIRE SPRINKLERS = **YES** (EXISTING)
FIRE ALARM SYSTEM (PER IBC SECTION 907.2)

PORTABLE FIRE EXTINGUISHERS:
REQUIRED SPACING OF FIRE EXTINGUISHERS (PER IBC 906.1) = 75'

EXITS | IBC CHAPTER 10:
1006.2.1 COMMON PATH OF EGRESS: F-1
ALLOWED: 100'
ACTUAL: 62'
H-3
ALLOWED: 25'
ACTUAL: 23'
1006.2.1 MINIMUM NUMBER OF EXITS: F-1
ALLOWED: 1
ACTUAL: 1
H-3
ALLOWED: 1
ACTUAL: 1

CODE SYMBOL LEGEND

FE	FIRE EXTINGUISHER
	MAXIMUM TRAVEL DISTANCE
	1-HOUR FIRE SEPARATION
	2-HOUR FIRE SEPARATION
	3-HOUR FIRE SEPARATION

Revisions

#	Description	Date

Drawing Title
CODE ANALYSIS

Date
2025.07.29

Mechanical:
Energy 1
David Magill
5500 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
4424 S. Park St.
Jackson, WY 83001
307.733.2087

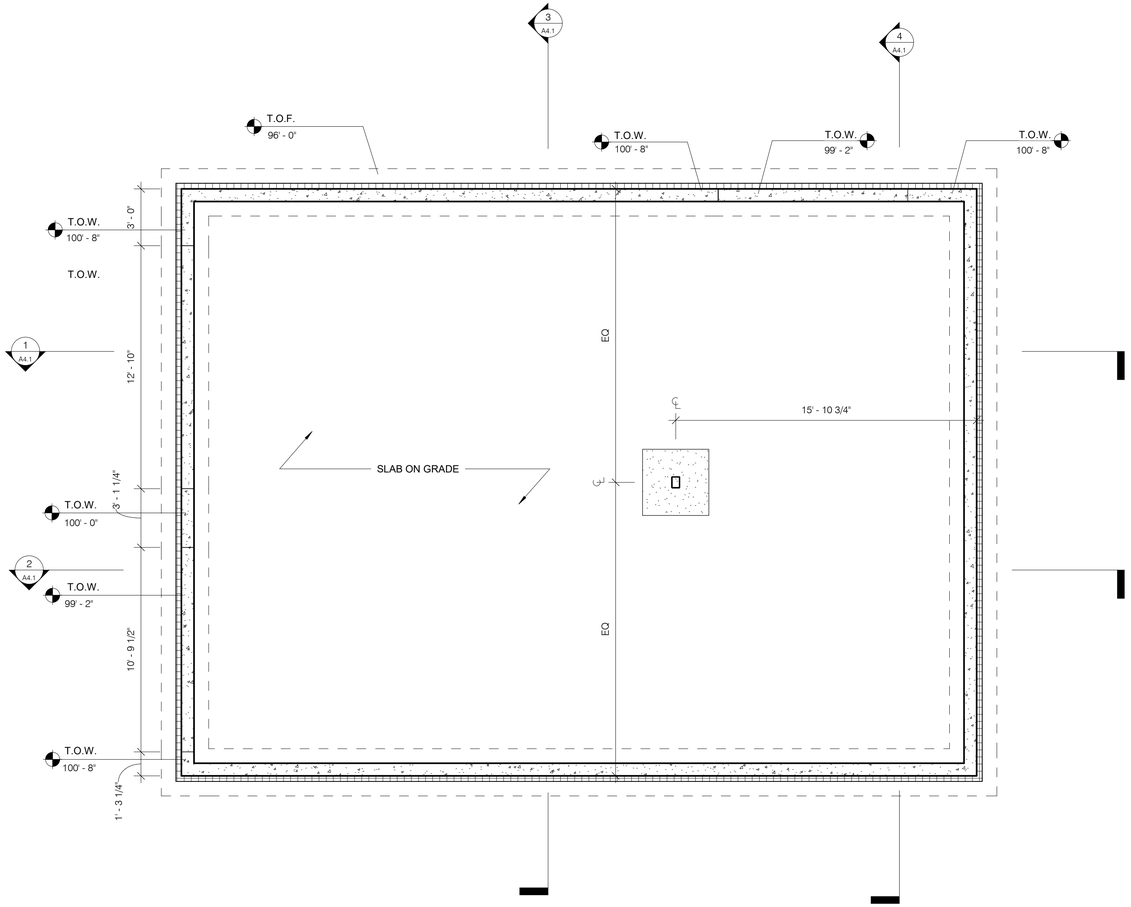
Structural:
Nelson Engineering
Carla Hansen
4424 S. Park St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
ToJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

G1.3



1 FOUNDATION PLAN - PROPOSED
1/4" = 1'-0"

Revisions		
#	Description	Date

Drawing Title
FOUNDATION PLAN

Date
2025.07.29

Mechanical:
Energy 1
David Magill
5500 Saint Mark Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
4424 S. Park St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
4424 S. Park St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

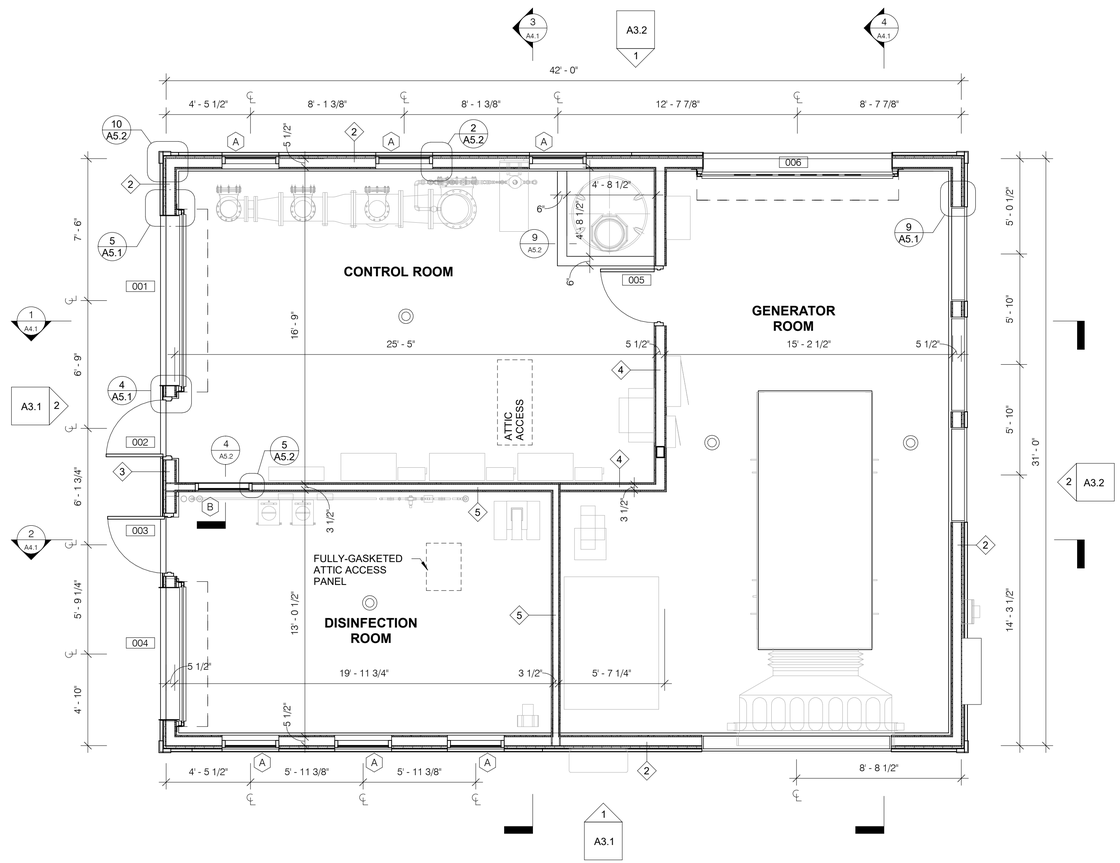
Project:
To J HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

A1.0

GENERAL PLAN NOTES:

1. ALL DIMENSIONS ARE GIVEN TO FACE OF FRAMING UNLESS OTHERWISE NOTED. COORDINATE DISCREPANCIES WITH THE ARCHITECT.



1 FLOOR PLAN - PROPOSED
1/4" = 1'-0"

#	Description	Date

Revisions

Drawing Title
FLOOR PLAN

Date
2025.07.29

Mechanical:
Energy 1
David Magill
5500 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

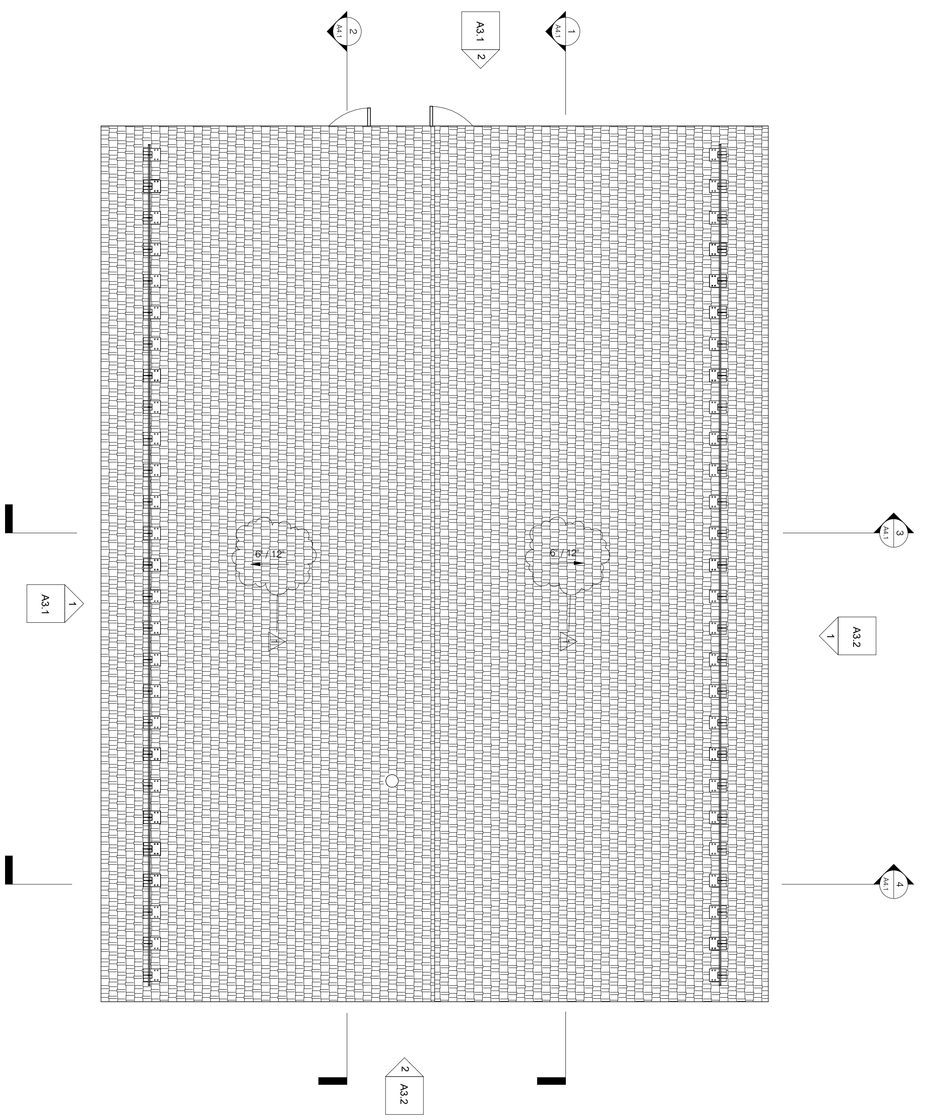
Structural:
Nelson Engineering
Carla Hansen
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
Tol HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
PO Box 4055
mail Jackson, WY 83001
610 W Broadway Ave #103
office Jackson, WY 83001
phone 307.249.8650

A1.1



1 ROOF PLAN - PROPOSED
1/4" = 1'-0"

A1.2

Architect:
Atelier 43, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

Project:
ToJ HIGH SCHOOL ROAD
PUMP HOUSE

Client:
TOWN OF JACKSON

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Mechanical:
Energy 1
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

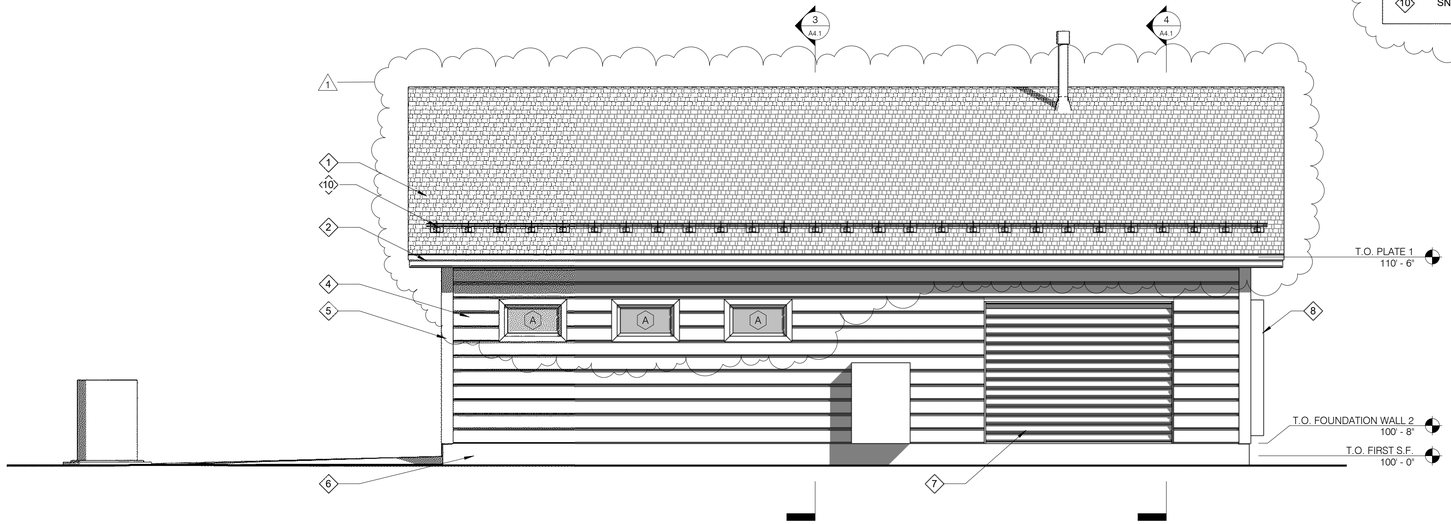
Drawing Title
ROOF PLAN

Date
2025.07.29

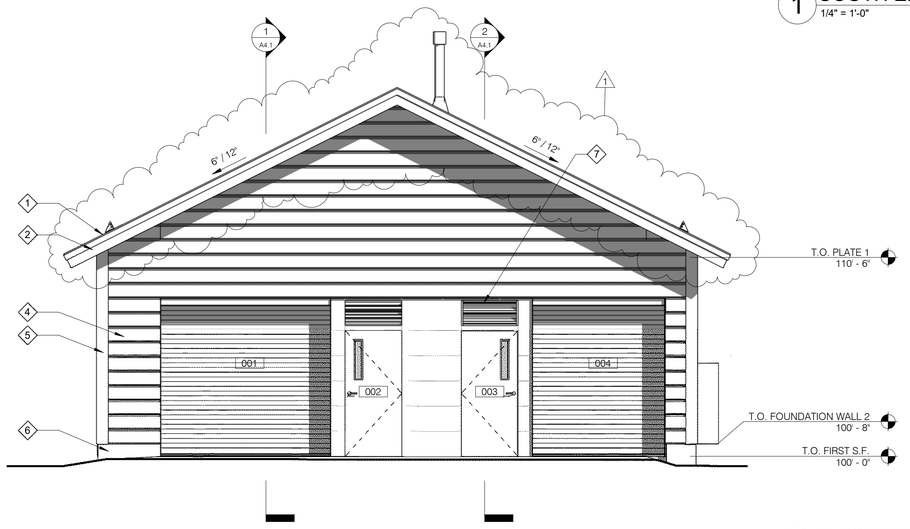
Revisions		
#	Description	Date
1	Revision 1	07-29-25

MATERIAL SCHEDULE:

1	CEDUR SYNTHETIC SHAKE ROOFING
2	CEDAR FASCIA
3	CEDAR SOFFIT
4	EVERLOG CONCRETE PLANK SIDING
5	EVERLOG CONCRETE TRIM
6	METAL FLASHING - PAINT COLOR T.B.D.
7	METAL VENT - PAINT COLOR T.B.D.
8	METAL UTILITY CASING - PAINT COLOR T.B.D.
9	METAL PANEL SIDING
10	SNOW GUARD SYSTEM



1 SOUTH ELEVATION
1/4" = 1'-0"



2 WEST ELEVATION
1/4" = 1'-0"

Revisions			
#	Description	Date	
1	Revision 1	07-29-25	

Drawing Title
BUILDING ELEVATIONS

Date
2025.07.29

Mechanical:
Energy 1
David Magill
5301 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
4583 Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
4583 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

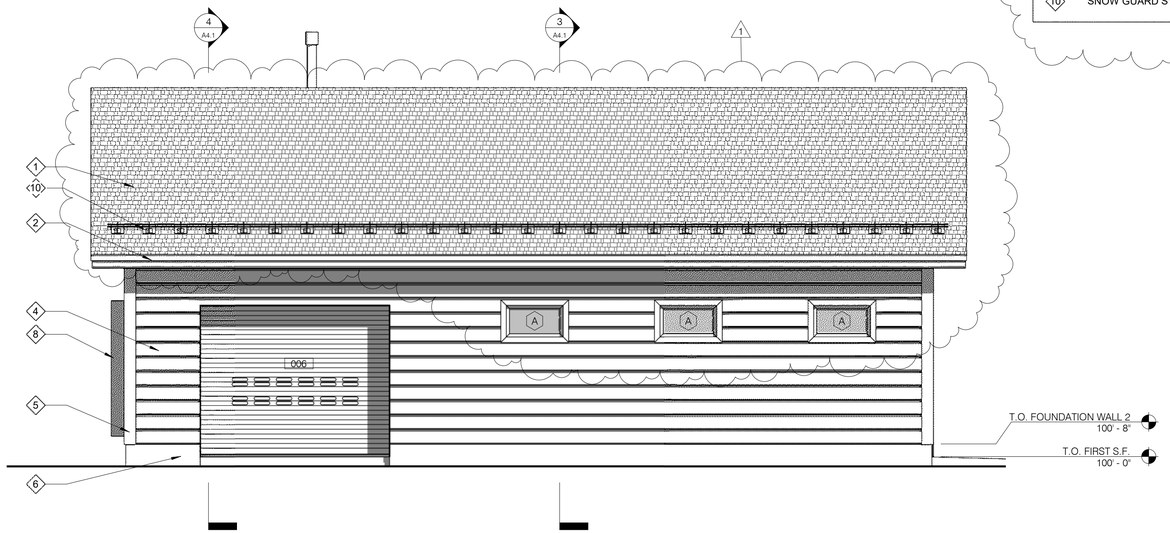
Project:
ToJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

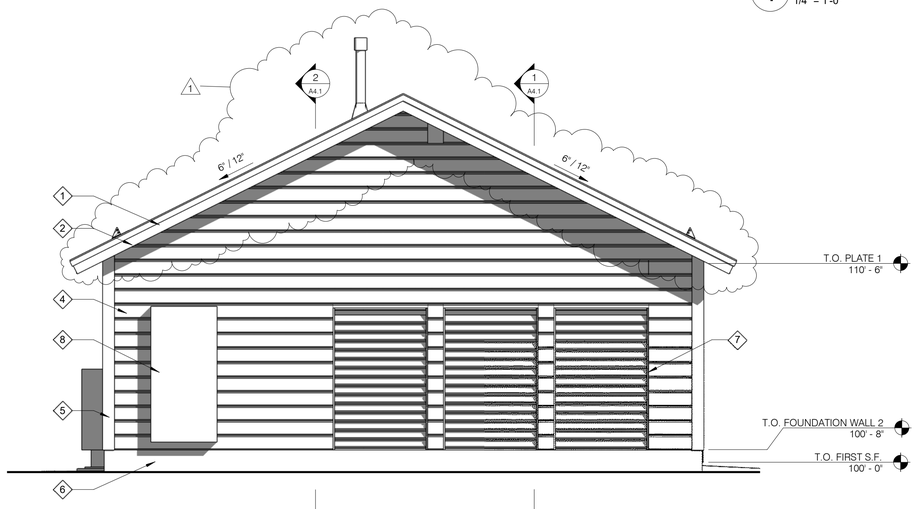
A3.1

MATERIAL SCHEDULE:

1	CEDUR SYNTHETIC SHAKE ROOFING
2	CEDAR FASCIA
3	CEDAR SOFFIT
4	EVERLOG CONCRETE PLANK SIDING
5	EVERLOG CONCRETE TRIM
6	METAL FLASHING - PAINT COLOR T.B.D.
7	METAL VENT - PAINT COLOR T.B.D.
8	METAL UTILITY CASING - PAINT COLOR T.B.D.
9	METAL PANEL SIDING
10	SNOW GUARD SYSTEM



1 NORTH ELEVATION
1/4" = 1'-0"



2 EAST ELEVATION
1/4" = 1'-0"

Revisions		
#	Description	Date
1	Revision 1	07-29-25

Drawing Title
BUILDING ELEVATIONS

Date
2025.07.29

Mechanical:
Energy 1
David Magill
5500 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
445 S. Cache St.
Jackson, WY 83001
307.733.2087

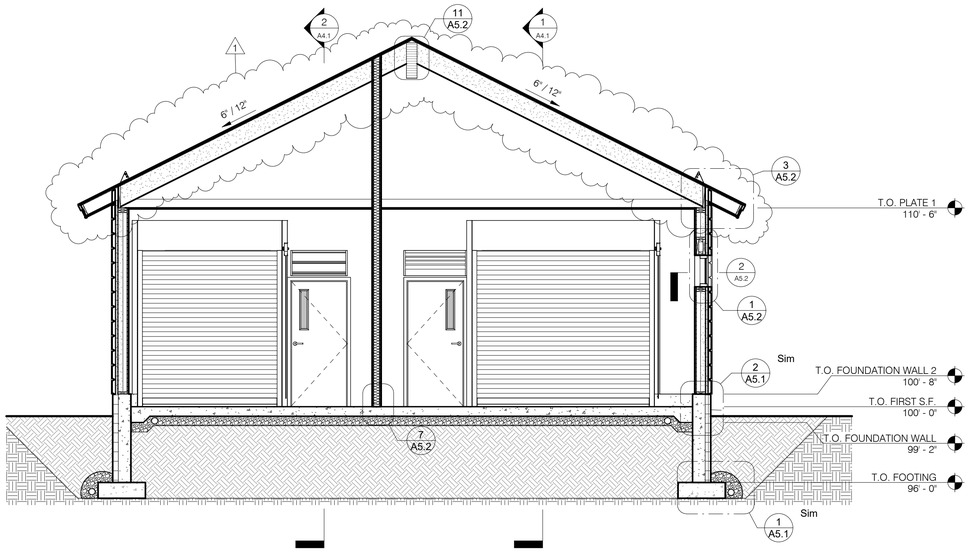
Structural:
Nelson Engineering
Carla Hansen
445 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

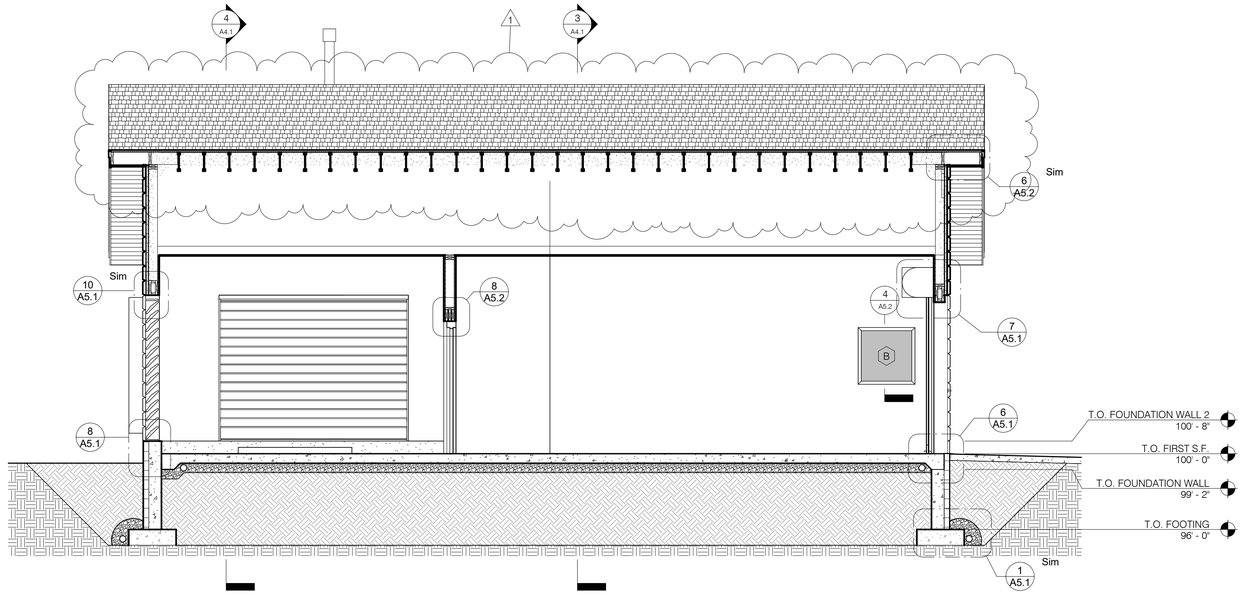
Project:
ToJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
PO Box 4055
Jackson, WY 83001
mail
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

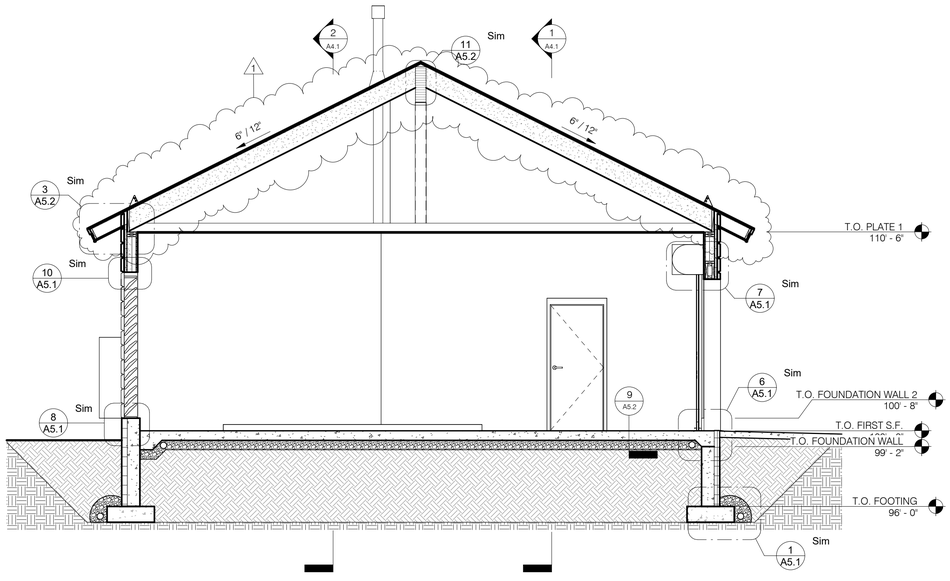
A3.2



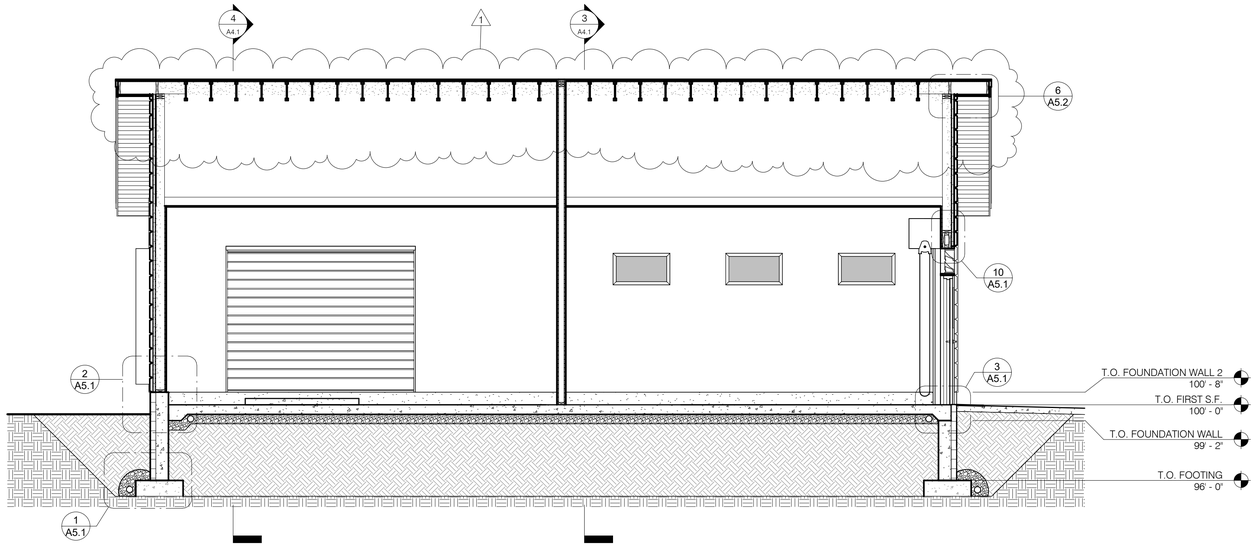
3 SECTION 3
1/4" = 1'-0"



1 SECTION 1
1/4" = 1'-0"



4 SECTION 4
1/4" = 1'-0"



2 SECTION 2
1/4" = 1'-0"

#	Description	Date
1	Revision 1	07-29-25

Drawing Title
BUILDING SECTIONS

Date
2025.07.29

Mechanical:
Energy 1
David Magill
5300 S. Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

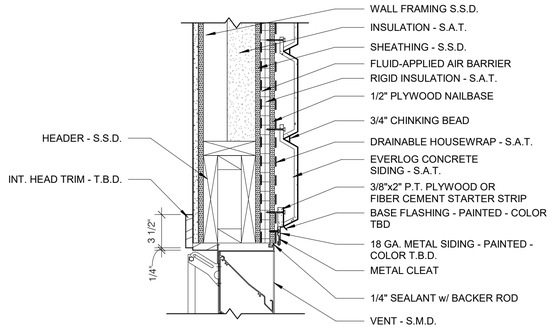
Structural:
Nelson Engineering
Carla Hansen
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

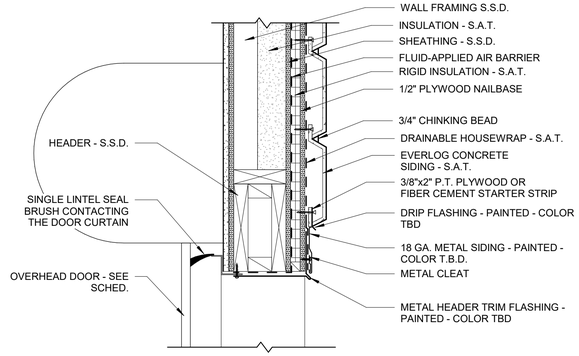
Project:
ToJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

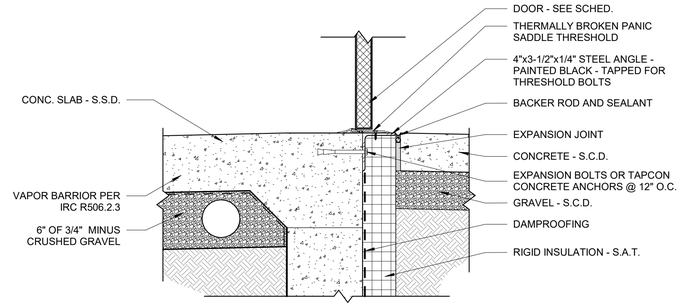
A4.1



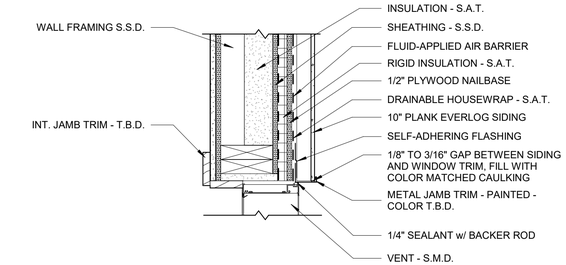
10 HEADER @ EXTERIOR VENT
1 1/2" = 1'-0"



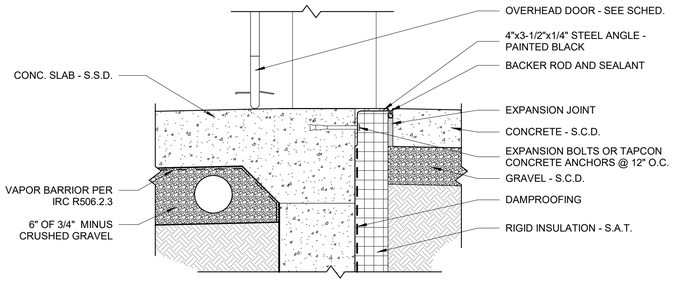
7 HEADER @ OVERHEAD DOOR
1 1/2" = 1'-0"



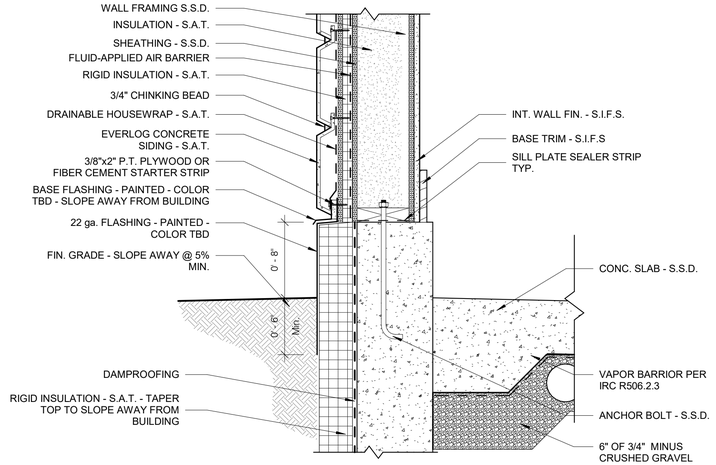
3 THRESHOLD @ EXTERIOR DOOR
1 1/2" = 1'-0"



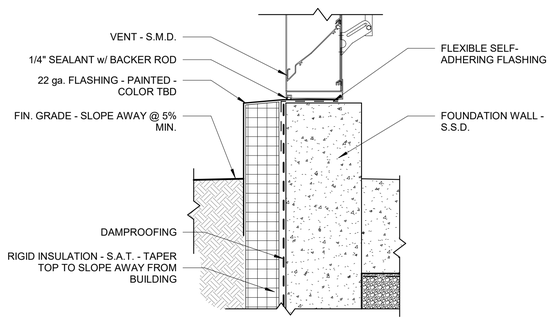
9 JAMB @ EXTERIOR VENT
1 1/2" = 1'-0"



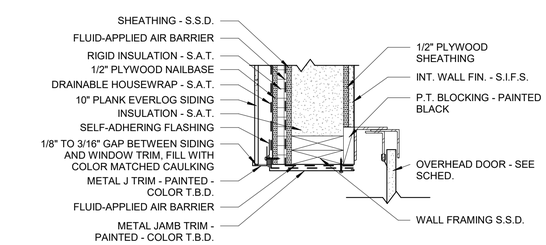
6 THRESHOLD @ OVERHEAD DOOR
1 1/2" = 1'-0"



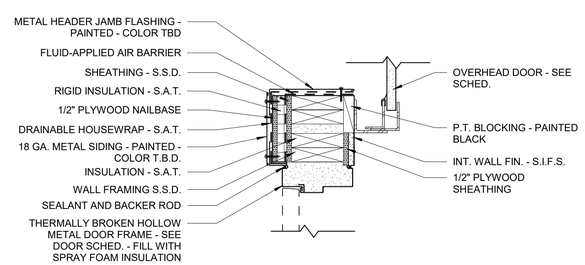
2 SILL PLATE SECTION
1 1/2" = 1'-0"



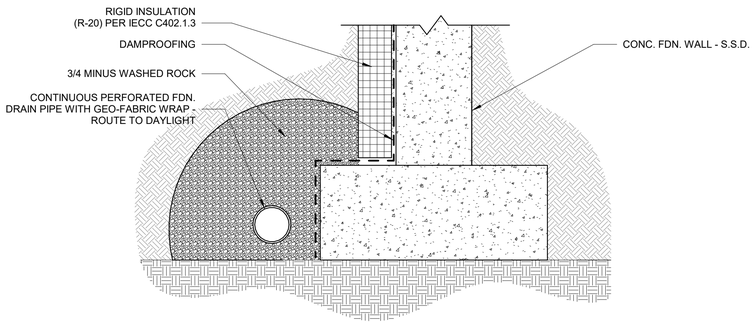
8 SILL @ EXTERIOR VENT
1 1/2" = 1'-0"



5 JAMB @ OVERHEAD DOOR
1 1/2" = 1'-0"



4 JAMB @ ENTRY DOORS
1 1/2" = 1'-0"



1 FOOTING SECTION
1 1/2" = 1'-0"

Revisions

#	Description	Date

Drawing Title
WALL SECTIONS / DETAILS

Date
2025.07.29

Mechanical:
Energy 1
David Magel
5500 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
445 S. Cache St.
Jackson, WY 83001
307.733.2087

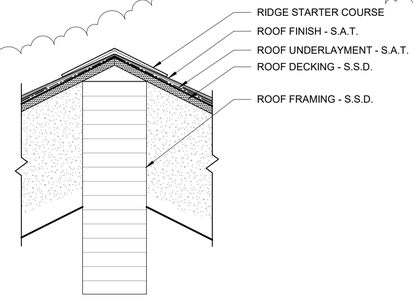
Structural:
Nelson Engineering
Carla Hansen
445 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

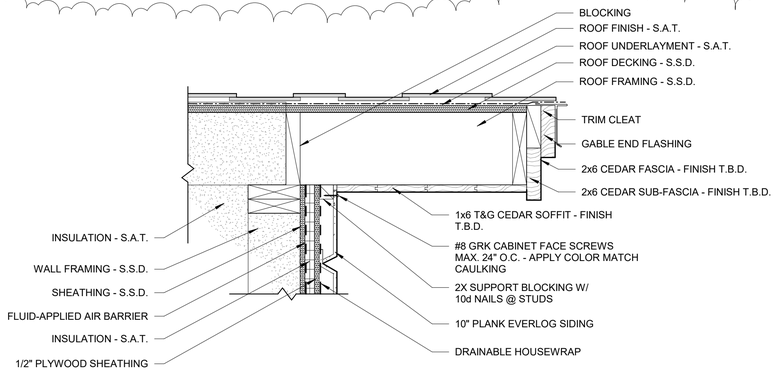
Project:
ToJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
PO Box 4055
Jackson, WY 83001
mail
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

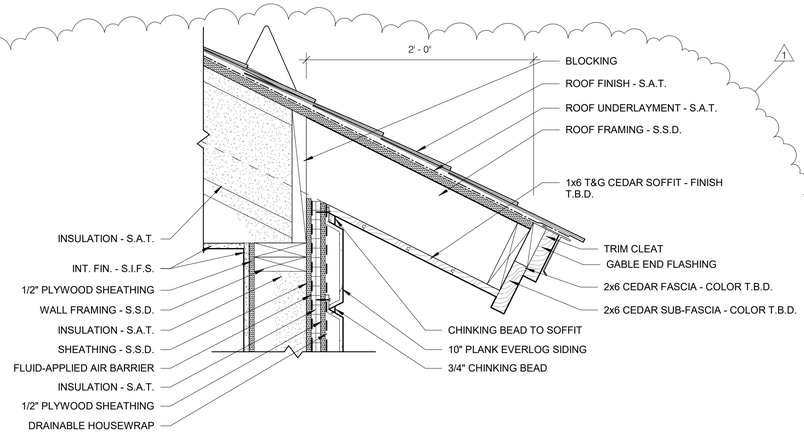
A5.1



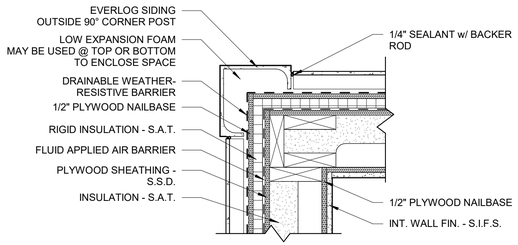
11 ROOF RIDGE SECTION
1 1/2" = 1'-0"



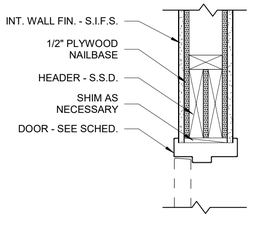
6 ROOF RAKE SECTION
1 1/2" = 1'-0"



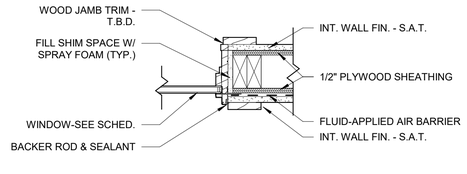
3 ROOF EAVE SECTION
1 1/2" = 1'-0"



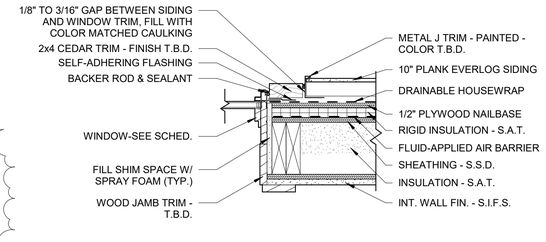
10 CORNER SECTION
1 1/2" = 1'-0"



8 HEADER @ INTERIOR DOOR
1 1/2" = 1'-0"

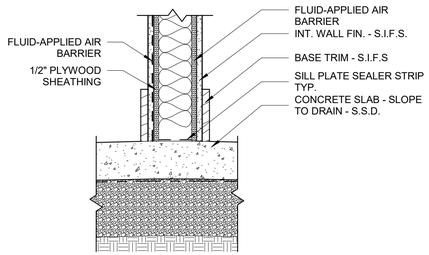


5 JAMB @ INTERIOR WINDOW
1 1/2" = 1'-0"

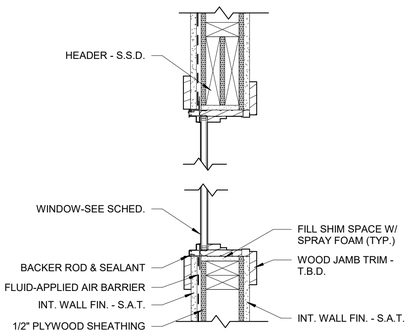


2 JAMB @ EXTERIOR WINDOW
1 1/2" = 1'-0"

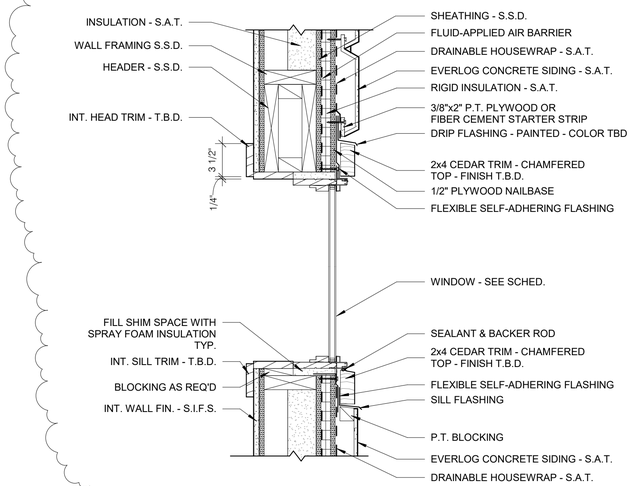
9 CONCRETE CURB SECTION
1 1/2" = 1'-0"



7 SILL PLATE @ DISINFECTION ROOM
1 1/2" = 1'-0"



4 WINDOW SECTION @ INTERIOR
1 1/2" = 1'-0"



1 WINDOW SECTION @ EXTERIOR
1 1/2" = 1'-0"

Revisions

#	Description	Date
1	Revision 1	07-29-25

Drawing Title
WALL SECTIONS / DETAILS

Date
2025.07.29

Mechanical:
Energy 1
David Magel
5500 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
445 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
445 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
ToJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
PO Box 4055
mail Jackson, WY 83001
610 W Broadway Ave #103
office Jackson, WY 83001
phone 307.249.8650

A5.2

GENERAL STRUCTURAL NOTES

A. DRAWINGS AND SPECIFICATIONS

1. The General Structural Notes apply to structural components of the "ToJ HSR Well House" located in Teton County, Wyoming.
2. These notes and drawings were prepared for the site described herein. Use of these documents for construction on any other site requires written permission from the Engineer.
3. Contractor shall verify all dimensions and site conditions in the field and coordinate with Architectural drawings prior to construction.

B. GOVERNING CODES AND REFERENCES

1. International Building Code (IBC), 2024 Edition.
2. Building Code Requirements for Structural Concrete, American Concrete Institute (ACI 318-19).
3. Steel Construction Manual, Fourteenth Edition, American Institute of Steel Construction (AISC).
4. National Design Specifications (NDS) for Wood Construction, 2018 Edition.
5. Minimum Design Loads for Buildings and other structures, (ASCE 7-22)
6. Concrete Reinforcing Steel Institute (CRSI), Manual of Standard Practice.
7. Geotechnical Investigation Report dated Dec. 2024 prepared by Phil Gyr of Nelson Engineering.

C. DESIGN CRITERIA

1. Ground Snow Load: 164 psf (LFRD) per ASCE 7-22 & ASCE Hazards Report;
   Ce: 0.9; Ct: 1.2; Cs: 1.0; Is: 1.25
2. Roof Snow Load: 124 psf (LFRD) per ASCE 7-22
3. Roof Dead Load: 15 psf
4. Floor Live Load: 100 psf
5. Floor Dead Load: 15 psf
6. Wind: Vult: 115 mph, Exposure D; Risk Category III
7. Seismic Parameters: Lat: 43.458°; Long.: -110.809°; Site Class D "Stiff Soil"; Ss: 1.14;
   S1: 0.33; Sds: 0.873; Sd1: 0.55; Design Category: D; Risk Category: III; Ie: 1.25;
   R: 6.5; Ω: 3; Cd: 4; Cs: 0.167; V=CsW
8. Allowable Soil Bearing Pressure: 4,000 psf per Geotechnical Report.

D. FOUNDATION NOTES

1. It is the responsibility of the Contractor to provide a safe working condition at underground excavations. All excavations should be laid back to safe slopes or properly shored in accordance with the most recent versions of the OSHA Construction Standards for Excavations, Part 1926, Subpart P. Excavations for utilities shall be shored if the propoer slope cannot be maintained.
2. Soils beneath slabs and footings shall be protected from freezing until backfilled.
3. Drainage shall be provided away from the structure during all phases of construction.
4. Any soil type encountered at the bottom of the footing excavations other than those of competent cobble and gravel, shall be removed until competent cobble and gravel alluvium is revealed, unless approved by the Geotechnical Engineer.
5. Structural fill shall be placed as necessary to achieve footing grade.
6. All Excavation; preparation; protection of site soils, and Structural fill requirements shall be found in the Geotechnical Investigation report. These notes are not a replacement of such report and should not be used alone. The Geotechnical Investigation Report must be reviewed prior to construction, and kept onsite for the contractor to reference during construction. These notes are a overview only of such report.
7. Any soil type encountered at the bottom of footing excavations other than those described in the Geotechnical Investigation Report shall be analyzed by the Geotechnical Engineer prior to construction.
8. Isolated boulders at footing grade shall be excavated and removed unless approved by the Geotechnical Engineer.
9. Native site soils may contain moisture sensitive silts and clays that will exhibit undesirable engineering properties when wetted. Every effort shall be made to reduce the infiltration of moisture from rainfall and groundwater into foundation bearing, slab, and roadway subgrade soils during construction.
10. Grading during construction shall be provided to drain storm water from the exposed excavations during precipitation and snowmelt events. See the Geotechnical Investigation report for actions to be taken during rain or snow events.
11. Refer to the Geotechnical Investigation Report for Structural Fill requirements, and the following drawings for the areas that Structural fill shall be placed.

E. REINFORCING STEEL

1. Concrete Reinforcing Steel shall be new billet steel conforming to ASTM A 615, Grade 60 including all #3 through #10 bars, stirrups and ties.
2. Concrete welded wire fabric reinforcement shall conform to ASTM A 185. Splice length shall be a minimum 12" unless noted otherwise.
3. All reinforcement shall be detailed, fabricated, and placed in accordance with the ACI Detailing Manual (SP-66), the CRSI Manual of Standard Practice, and ACI Standard Tolerances for Concrete Construction and Materials (ACI 117).
4. Cold bending of reinforcing bars is to be limited to bars which have not been previously bent. Bars may be bent only once. Any bend is limited to an interior angle of 90 degrees or greater. Bending tools with the following bending diameters should be used:
   - #3 through #8 bars: 6 x bar diameter
5. The minimum Concrete Cover over reinforcement shall be asfollows unless noted otherwise on the drawings:
   a. Concrete cast against and permanently exposed to earth: **3"** -all bar sizes
   b. Concrete exposed to earth or weather:
      - **2"** -#6 thru #18 bars
      - **1-1/2"** -#5 bar and smaller & W31 or D31 wire & smaller
   c. Concrete not exposed to weather or in contact with ground:
      - Slabs, walls, joists: **3/4"** -#11 bar and smaller
      - Beams, Columns:**1-1/2"** -Primary reinforcement, ties, stirrups, and spirals
6. All reinforcement shall be continuous unless noted otherwise. Provide bent corner bars (18"x18" unless noted otherwise) to match and lap with horizontal bars at corners and intersection of walls, beams, bond beams and footings. Dowel all vertical wall rebar to foundations. Securely tie all rebar, including dowels, in location before placing concrete or grout. "Stabbing" of bars into poured concrete is not permitted.
7. All reinforcement splice locations are subject to approval. Provide shop drawings for approval by the Engineer prior to fabrication.
8. Development Lengths and Lap Splices shall be in accordance with ACI 318-19. Where splice lengths are not shown on the drawings, the following shall apply:
   - #4 bars 25" #6 bars 37" #8 bars 62"
   - #5 bars 31" #7 bars 54" #9 bars 70"
9. Spacings noted for rebar are not to be exceeded. Other tolerances for rebar placement shall conform to ACI 117-90.
10. Securely tie reinforcement in place with double annealed 16 gauge tie wire.
11. Welding of reinforcement is not permitted without approval of the Structural Engineer. Tack welding of reinforcement is prohibited.
12. Precast mortar blocks or ferrous metal chairs, spacers, metal hangers or supporting wires shall be used to securely hold reinforcing bars in position. Metal chairs, bolsters, or other metal that are in contact with the exterior surface of the concrete shall be galvanized. Wood, aluminum or plastic supports shall not be used.
13. Walls with openings 1'-0" or greater in either direction, shall have 2-#5 bars at all sides, and bars shall extend 24" beyond the opening at both ends, unless noted otherwise on the drawings.

F. CONCRETE

1. Ready-Mixed concrete shall conform to ASTM C 94. Minimum cement content shall be 6 bags (564 pounds) per cubic yard. Cement shall be type IIA. Cement shall conform to ASTM C 150. Aggregates shall conform to ASTM C 33. Mix designs shall be prepared in accordance with ACI 301-10.
2. Submit concrete mix designs at least 15 days prior to performing work.
3. Maximum water cement ratio: **0.5**
4. Maximum Aggregate Size: **1"**
5. Construction to be in accordance with ACI 318-19 Testing, Materials, and Construction Requirements.
6. Tolerances for Concrete Construction and Materials shall conform to ACI 117-90
7. Concrete shall conform to ACI 301-10. Concrete shall be air-entrained as follows:
   - 6% "Severe exposure" - Foundation Walls, Exterior Slabs
   - 5% "Moderate exposure" - Footings
   - 3 1/2% "Mild Exposure" - Interior slabs
8. Provide minimum concrete strength as follows:
   - 4000 psi @ 28 days at Interior Slab
   - 3000 psi @ 28 days at Footings & Foundation Walls
9. No admixtures without approval. Admixtures containing chlorides shall not be used. Concrete shall not be in contact with aluminum.
10. When the mean daily temperature is expected to or has dropped below 40 degrees (F) for three or more successive days, the contractor shall comply with the provisions of ACI 306R-88 "Cold Weather Concreting". Also reference chapter 12 of Portland Cement Association publication "Design and Control of Concrete Mixtures".
11. Joint placement not as shown on the drawings shall have prior written approval of the engineer.
12. Forms shall be inspected and approved by the engineer prior to the placing of concrete.
13. Concrete surfaces shall be finished in accordance with ACI302.1R-"Concrete Floor and Slab Construction", as follows:
    a. Slab Floors: "Class 1" - uniform steel-troweled finish. Finished concrete floor surfaces shall vary no more than 1/4" per 10 feet.
    b. Exterior Slabs: "Class 2 and 3"
14. Cold joints that will have additional concrete placement adjacent or above must have a joining surface intentionally roughened by raking or other means to a depth of 1/4 inch prior to additional concrete placement.
15. Mechanically vibrate all concrete when placed.
16. Wait a minimum of 48 hours between all adjacent concrete castings.
17. Minimum strength for removal of bottom forms and shoring shall be 75% of specified strength at 28 days. Wall forms may be removed in 48 hours for minimum 4000 psi concrete.
18. Formed Surfaces: Formed surfaces shall have a curing compound applied upon the removal of the wall forms, -OR- forms can be left on for a minimum curing time of 7 days, -OR- time necessary for the concrete to obtain 70% of 28 day design strength.
19. Un-Formed Surfaces: Curing must begin immediately after finishing concrete. Cure un-formed surfaces, including floors and slabs with a curing compound -OR- coverings suitable for a wet cure method.
20. Concrete walls to have a minimum 7 days of curing time prior to placing any load against the wall.
21. Grout beds below column base plates to be at min 11/2" thick (U.N.O) & consist of a Non-Shrink; Non-Metallic Grout with min. 28 day strength of 8,000 psi.

G. WOOD FRAMING

Unless noted otherwise on the Structural Drawings or Project Specifications, the following wood framing specifications and notes shall apply:

1. Dimensional Framing Lumber:
   - #1 Douglas Fir or better (structural members)
   - #2 Douglas Fir or better (light framing)
2. Glue-Laminated Beams (by AITC standards):
   - Douglas Fir 24F-V4
   - Douglas Fir 24F-V8 (at cantilevers)
3. Laminated Veneer Lumber (by "Boise Engineered Wood Products") as indicated on the drawings:
   a. Versa-Lam Grade 2.0 2800
      - Fb=2800 psi
      - Fv=285 psi
      - E=2,000,000 psi

   Versa-Lam Grade 2.0 3100
      - Fb=3100 psi
      - Fv=285 psi
      - E=2,000,000 psi
4. Wood I-Joists (by "Boise Engineered Wood Products") as indicated on the drawings.
5. Plywood Sheathing
   a. Roof sheathing: 19/32" APA rated plywood sheathing, Exposure 1, conforming to PS 1 with a minimum span rating of 40/20. Install with face grain perpendicular to joist span with end joints staggered. Unless noted otherwise, nail roof sheathing as follows:
      - Use 10d Common nails: Shank Size = 0.148"; Shank Length = 3"
      - 10d @ 6" o.c. along all panel edges
      - 10d @ 12" o.c. along all intermediate supports
   b. Plywood wall sheathing: 15/32" APA rated sheathing conforming to PS 1 or PS 2. Unless noted otherwise on the drawings, construct exterior walls with 2x blocking along all edges not supported by studs and nail as follows:
      - Use 10d Common nails -or- 8d Common nails per Schedule
      - 10d Common nails: Shank Size = 0.148"; Shank Length = 3"
      - 8d Common nails: Shank Size = 0.134"; Shank Length = 2-1/2"
      - 8d nails @ 6" o.c. at all panel edges and blocking
      - 8d nails @ 12" o.c. at intermediate supports
      - Where panels are applied on both faces of a wall and nail spacing is less than 6" on center on either side, panel joints shall be offset to fall on different framing members or framing shall be 3" nominal or thicker and nails on each side shall be staggered. Sill plate shall be 3" nominal or thicker.
   c. Unless noted otherwise all nails for attaching plywood shall be unfinished common nails of size shown. Nails for attaching plywood in high humidity, and treated wood locations nails shall be galvanized by hot-dip or tumbled process and shall not be electro-plated.
6. Anchor Bolts shall conform to ASTM A 307.
   a. Unless noted otherwise, anchor bolts are to be 5/8" diameter, and are to be spaced no further apart than 48" o.c., or as noted on the Structural Drawings.
   b. Anchor bolts shall be embedded at least 8" into the concrete unless noted otherwise. There shall be a minimum of 2 bolts per segment of sill plate, with one bolt located not more than 12" or less than 7 bolt diameters from each end of the sill. Plate washers a minimum of 3"x3"x0.229" thick shall be used on each bolt.
7. Premanufactured metal wood connectors shall be installed according to manufacturer's recommendations for the maximum load capacity, unless noted otherwise on the drawings.
8. All wood in contact with concrete shall be preservative pressure treated in conformance with the American Wood Preservers' Association AWPA C-1.

H. STRUCTURAL STEEL

1. Steel materials:
   - W Shapes: ASTM A 992, Fy=50ksi
   - Channels, Angles, Plates: ASTM A 36, Fy=36ksi
   - HSS Tubes: ASTM A500, Fy=46ksi
   - Headed Studs: ASTM A108, Type B
   - Anchor Bolts: ASTM A 307
   - Steel to Steel Connection Bolts: ASTM A 325
   - Steel Nuts: ASTM A 563
   - Steel Washers: ASTM A 436
   - Threaded Rods: ASTM A 307 or A 36
2. Structural steel design, fabrication & erection shall conform to the AISC "Code of Standard Practice for Steel Buildings and Bridges" as modified by the structural drawings & project specifications.
3. Structural steel shall be fabricated in a plant certified by the AISC as qualified to fabricate Category I - Conventional Steel Structures OR the fabricator shall demonstrate a consistent record of at least 10 successful projects of similar or greater over the preceding 5 years.
4. Shop drawings shall be submitted including plans, elevations, sections, and details for fabrication and erection of structural steel framing, connections, and accessories.
5. Connections may be welded or bolted unless noted on the drawings.
6. Bolted Connections:
   - ASTM A 325 Bolts at Steel Connections
   - ASTM A 307 Bolts at Wood to Steel Connections
   - ASTM A 307 Bolts at Wood to Wood Connections
   - ASTM A 307 Embedded Anchor Bolts
7. Welded Connections: E70xx
   a. All welding shall be performed in accordance with the American Welding Society "Structural Welding Code - Steel" (AWS D1.1).
   b. Shop drawings shall indicate the type of weld and electrodes required.
   c. All welding personnel shall be qualified in accordance with AWS D1.1, Section 4. Testing performed more than 6 months prior to the start of welding is acceptable, provided written documentation is submitted showing that the welder has continued to use the applicable welding process on an ongoing basis since the test was conducted.
   d. Welding shall be performed in accordance with the appropriate welding procedure specification (WPS) for the joint. All WPSs used by the contractor shall be prequalified per AWS D1.1.
   e. Groove weld preparation details shall be in accordance with AWS D1.1.
   f. Weld tabs shall be in accordance with AWS D1.1, and further, weld tabs shall extend beyond the edge of the joint a distance equal to a minimum of the part thickness, but not less than one inch.
   g. Backing bars shall be in accordance with AWS D1.1, and further, all tack welds attaching backing bars to the steel prior the welding of the joint shall be made within the joint.
   h. Welding inspection procedures shall meet the requirements of the AWS D1.1 and the Quality Assurance Plan.
   i. All Welding Inspectors shall be trained and thoroughly experienced in inspecting welding operations, and qualified in accordance with AWS D1.1. Welding Inspectors shall be Certified Welding Inspectors, or Senior Certified Welding Inspectors, as defined in AWS QC1, "Standard and Guide for Qualification and Certification of Welding Inspectors", latest edition.
   j. Nondestructive testing personnel shall be qualified under either of the American Society for Nondestructive Testing, Inc. (ASNT) documents referred to above.
8. Structural members dependent upon concrete or other structural members for support shall be adequately braced until all the structure is complete.
9. Splicing of steel members is not permitted, unless noted on the drawings.
10. Changes in size or position of structural elements are prohibited unless noted as proposed changes on the shop drawings, and accepted by the Engineer.
11. Fabricate all beams with mill cambers upward
12. Final bolting or welding of the structure shall not be performed until as much of the structure that will be stiffened thereby has been properly aligned.
13. Minimum plate size shall be 3/8" and minimum bolt size shall be 3/4", unless noted otherwise.
14. All re-entrant corners such as copes and blocks shall be cut and shaped notchfree with a radius of at least 1/2".
15. All steel members shall be given one shop coat of primer and approved paint. Surfaces to be field welded or embedded in concrete shall not be painted.

I. MISCELLANEOUS

1. Changes, omissions or substitutions are not permitted without approval of the Engineer.
2. All materials and workmanship shall conform to the 2024 International Building Code (2024 IBC).
3. Contractor shall verify all dimensions and coordinate openings and embedded items noted on construction documents with the appropriate trades before starting work.
4. It is the sole responsibility of the Contractor to ensure that the structure is temporarily braced in a manner to resist earth, wind, snow, and construction loads or combinations thereof until all supporting structures are in place and concrete is sufficiently cured.
5. Existing conditions of the site and structure are to be thoroughly investigated by the contractor. The contractor shall notify the Engineer of any discrepancies between the site investigation and the contract documents before fabrication and/or construction begins.

J. SHOP DRAWINGS

1. The following shop drawings and calculations when applicable, shall be submitted for approval prior to fabrication and/or installation.
   a. Concrete Reinforcement
   b. Concrete Mix
   c. Steel Shop Drawings
   d. Glulam & LVL Members
2. Shop drawings shall be thoroughly reviewed and approved by the contractor prior to submittal to the Engineer. Shop drawings will be returned for resubmittal if a cursory review reveals significant errors which should have been corrected by the Contractor.
3. Allow 15 days for initial review of each Shop Drawing & Submittal package from the date recieved.
4. Any resubmittal of a detail sheet with added information shall be accompanied by location plan identifying the members involved, and clouding around added information.
5. Checking of design changes proposed by the Contractor without prior consultation with the Engineer will be at the Contractors expense.
6. Any Engineering/Design submitted for review shall be appropriately sealed by an Engineer licensed in the State of Wyoming.

Structural Schedule of Special Inspections

LEGEND:
C = CONTINUOUS P = PERIODIC S = SUBMITTAL
EOR = ENGINEER OF RECORD PE = PROFESSIONAL ENGINEER GE = GEOTECHNICAL ENGINEER
BI = BUILDING INSPECTOR EIT = ENGINEER IN TRAINING TI = TESTING TECHNICIAN
CFTT = CERTIFIED FIELD TESTING TECHNICIAN

VERIFICATION AND INSPECTION	EXTENT:	AGENT QUALIFICATION
SOILS (IBC 1705.6)		
Verify adequate material below footings	P	TT -OR- GE
Verify excavations are extended to proper depth and have reached proper material	P	TT -OR- GE
Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	P	TT -OR- GE
Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	C	TT
Verify properly prepared site and subgrade prior to placement of concrete foundation system & test fun in-place dry density of compacted fill complies with the soils report and bearing capacity requirements.	P	TT -OR- GE
CONCRETE CONSTRUCTION (IBC 1705.3)		
Inspect reinforcement, and verify placement	P	TT -OR- BI
Inspect anchors & embedded plates to be cast into concrete.	P	PE -OR- TT
Field verify use of required design mix, per approved submittal review.	S : P	EOR (S) ACI CFTT (FIELD)
Inspect formwork for shape, location, and dimensions of the concrete member being formed.	P	TT -OR- BI
Prior to placement, obtain samples (concrete cylinders) for strength tests, & field verify slump, air content, and temperature tests	C	ACI CFTT
Inspect concrete placement for proper application techniques	C	BI -OR- ACI CFTT
Inspect post installed anchors where indicated on plans in accordance with approved ICC-ES report & specified installation techniques.	C (U.N.O)	PE, EIT
Verify maintenance of specified curing temperature and techniques	C	ACI CFTT
Inspect erection of Precast concrete members	P	PE -OR- TT
In addition to Field Special Inspections Required: Lab testing Requirements Include: (7) (min.) Concrete Cylinders to be taken for every 50 cubic yards placed, or min. once per day, with Slump, Air Content, & Temperature at placement recorded. [Unless noted otherwise in Project Specifications] (2) Cylinders Broke at 7 days (2) Cylinders Broke at 28 days (1) Extra Broke at Engineers or Contractors request ADDITIONAL Cylinders will be required for cold weather placement. If concrete is placed in cold weather conditions: Concrete must tested & heated (2) Additional cylinders taken to be left on the job site & cured/protected the same as the concrete. The field cured cylinders will be broke with the 7 day and 28 day cylinders. Additional Cylinders can be provided at Contractors request for early removal of formwork or early loading on walls.		
STRUCTURAL WOOD		
Periodic Special Inspection is required for wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the main wind force -OR- seismic force resisting system, including wood shear walls, wood diaphragms, drag struts, braces and hold-downs. ▪ Special Inspection or NDT required for wood shear walls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other elements of the main wind force -OR- seismic force resisting system, where the fastener spacing of the sheathing is more than 4 inches on center.	P	PE, EIT

STRUCTURAL NOTATION LEGEND

BTM.	BOTTOM	LONG.	LONGITUDINAL
B.O.	BOTTOM OF	O.C.	ON CENTER
B.U.	BUILT UP	O.H.	OVERHANG
CLR	CLEAR	SIM.	SIMILAR
C.L.	CENTERLINE	T.O.	TOP OF
EL.	ELEVATION	TYP.	TYPICAL
E.O.R.	ENGINEER OF RECORD	U.N.O.	UNLESS NOTED OTHERWISE
FDN	FOUNDATION	N.T.S	NOT TO SCALE
FTG	FOOTING	WWF	WELDED WIRE FABRIC
G.L.	GRID LINE		

STRUCTURAL DRAWING INDEX

S1.0	GENERAL STRUCTURAL NOTES
S1.1	GENERAL STRUCTURAL DETAILS
S2.0	STRUCTURAL FRAMING PLANS
S3.0	STRUCTURAL SECTIONS
S4.0	STRUCTURAL FOUNDATION & FRAMING DETAILS

CONSTRUCTION SET

No.	REVISION DESCRIPTION	BY	DATE
⚠	ROOF SLOPE REVISION, REVISED DRAWINGS: S2.0, S3.0, & S4.0	CH	8/04/25

Carla M. Hansen

Digitally signed by Carla M. Hansen
DN: C=US, E=chansen@nelsonengineering.net, O=Nelson Engineering, CN=Carla M. Hansen
Location: Jackson Wyoming
Reason: I am approving this document
Date: 2025.08.04 12:03:31-06'00'

Professional Engineer (Civil) CARLA M. HANSEN PE 11065 Carla M. Hansen Date 08/04/2025 WYOMING

DATE	2025.02.13	REV.
SURVEYED		
ENGINEERED	AMB	
DRAWN	AMB	
CHECKED	CMH	
APPROVED	CMH	

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

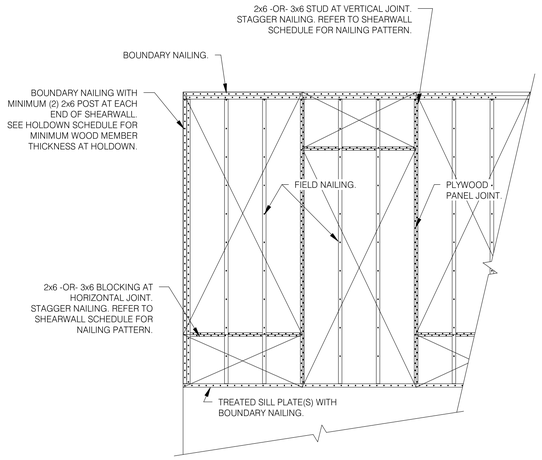
DRAWING TITLE: GENERAL STRUCTURAL NOTES

JOB TITLE: ToJ HIGH SCHOOL ROAD PUMP HOUSE
TOWN OF JACKSON, WY 83001

DRAWING NO: S1.0

JOB NO: 23-302-02

© NELSON ENGINEERING Jackson Hole Wyoming All Rights Reserved Unpublished Work



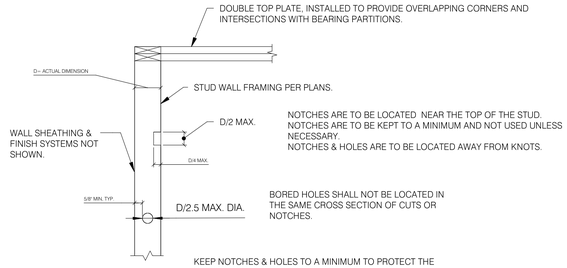
TYPICAL PLYWOOD SHEARWALL NAILING DETAIL

Scale: N.T.S.

STUD SIZE D = actual depth	MAX. HOLE Dia. Ø = D/2.5 max.	MAX. NOTCH DEPTH D/4 max.
2x4	1-3/8"	7/8"
2x6	2-3/16"	1-3/8"
2x8	2-7/8"	1-3/4"

Notes:
1. Bored holes shall not be located in the same cross section of cut or notch in stud.
2. If the hole dia. is to exceed the D/2.5 Max., a hole diameter that is less than 60% of the stud actual depth can be located in no more than two successive studs; and both studs must be doubled. This can not be used where studs are supporting a window header or column load from above. 5/8" min. clear distance to each edge of stud must be maintained.
3. At Interior Non-Bearing stud walls, the Maximum Bored Hole Diameter is 60% of the stud depth, the maximum Notch Depth is 40% of the stud depth. A 5/8" Edge distance at each edge must be maintained, and bored holes shall not be located in the same cross section of cut or notch in the stud.

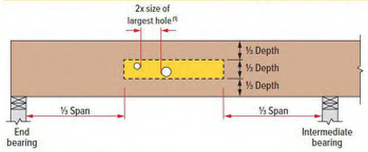
CUTS, NOTCHES, AND BORED HOLES IN COLUMNS, HEADER SUPPORT MEMBERS, WALL TOP PLATES, OR BUILT UP COLUMNS SUPPORTING LOADING FROM ABOVE ARE PROHIBITED, EXCEPT WHERE PERMITTED BY THE PROJECT ENGINEER.



ALLOWABLE PLACEMENT OF HOLES & NOTCHES IN BEARING WALL STUDS

Scale: N.T.S.

Versa-Lam LVL Allowable Holes



NOTES

(1) The horizontal distance between adjacent holes must be at least two times the diameter of the larger hole. This restriction also applies to the location of holes relative to bolt holes in multiple ply beams. Holes shall not be stacked vertically.

- Round holes may be drilled or cut with a hole saw anywhere within the shaded area of the beam.
- Square and rectangular holes are not permitted.
- Do not drill more than three access holes in any four foot long section of beam.
- These limitations apply to holes drilled for plumbing or wiring access only. The size and location of holes drilled for fasteners are governed by the provisions of the National Design Specification® for Wood Construction.
- Beams deflect under load. Size holes to provide clearance where required.
- Allowable Round Holes table at left is valid for beams supporting uniform load only. For beams supporting concentrated loads or beams with larger holes, use BC Calc® software or contact Boise Cascade EWP Engineering.

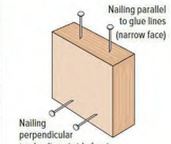
Allowable Round Holes

Table valid only for beams supporting uniform load.

Beam Depth	Max. Hole Diameter
5½" to less than 7¼"	¾"
7¼" to less than 9¼"	1"
9¼" to less than 18"	2"
18" to less than 24"	3"
24"	4"

Closest Allowable Nail Spacing

Nail Size	Nailing Parallel to Glue Lines (Narrow Face)(1)						Nailing Perpendicular to Glue Lines (Wide Face)	
	Versa-Lam® LVL						All Versa-Lam® LVL Products	
	1⅝"		1¾"		3½" and wider			
	O.C.	End	O.C.	End	O.C.	End	O.C.	End
8d Box (0.113"ø x 2.5")	3"	1½"	2"	1"	2"	½"	2"	1"
8d Common (0.131"ø x 2.5")	3"	2"	3"	2"	2"	1"	2"	1"
10d and 12d Box (0.128"ø x 3", 3.25")	3"	2"	3"	2"	2"	1"	2"	1"
16d Box (0.135"ø x 3.5")	3"	2"	3"	2"	2"	1"	2"	2"
10d and 12d Common and 16d Sinker (0.148"ø x 3", 3.25")	4"	3"	4"	3"	2"	2"	2"	2"
16d Common (0.162"ø x 3.5")	6"	4"	6"	3"	2"	2"	3"	2"

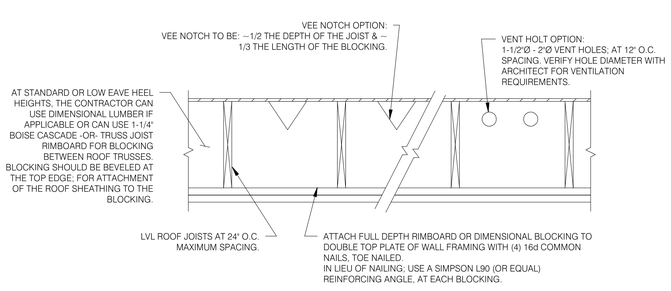


(1) For 1¾" thickness and greater, two rows of nails (such as for a metal strap) are allowed (use ½" minimum offset between rows and stagger nails).

- Offset and stagger nail rows from floor sheathing and wall sole plate.
- Simpson Strong-Tie A35 and LPT4 connectors may be attached to the side of Versa-Lam® LVL. Use nails as specified by Simpson Strong-Tie.

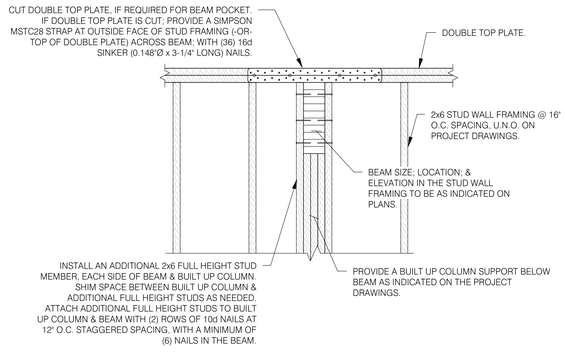
ALLOWABLE PLACEMENT OF HOLES & NOTCHES IN LVL JOISTS

Scale: N.T.S.



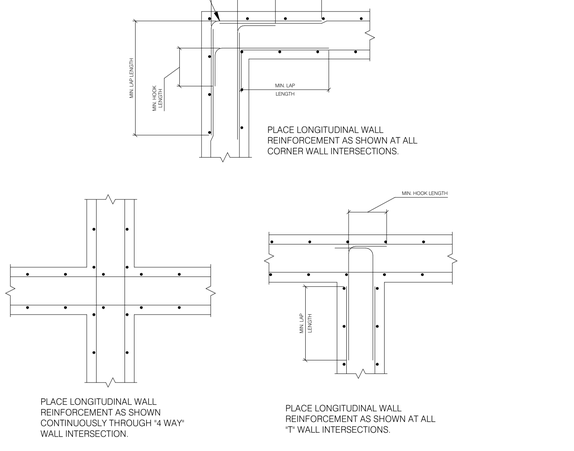
TYPICAL RIMBOARD BLOCKING DETAIL

Scale: N.T.S.



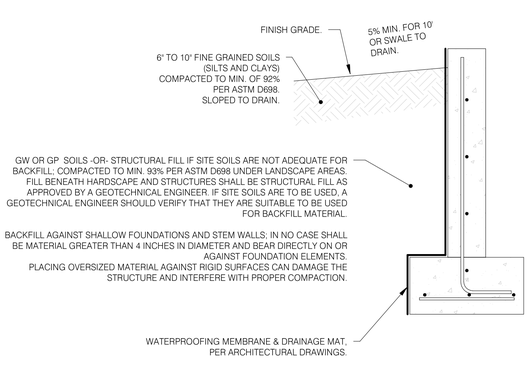
TYPICAL END BEAM POCKET DETAIL

Scale: N.T.S.



TYPICAL CORNER & INTERSECTION REINFORCEMENT DETAILS

Scale: N.T.S.



TYPICAL FOUNDATION BACKFILL DETAIL

Scale: N.T.S.

UNLESS NOTED OTHERWISE, THE REINFORCEMENT DETAILS IN THE FOLLOWING SCHEDULE SHALL APPLY:

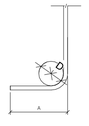
MINIMUM REINFORCEMENT LAP SPLICE LENGTHS

#3 - 19"	#5 - 31"	#7 - 54"	
#4 - 25"	#6 - 37"	#8 - 62"	

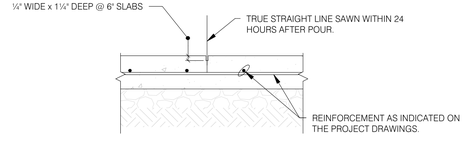
NOTE:
1. WHERE DIFFERENT SIZE BARS ARE LAPPED, USE LARGER BAR LAP LENGTH.

STANDARD HOOK DIMENSIONS

90° HOOK 180° HOOK



"D"	"A"	"B"	"C"	"E"
2-1/4"	6"	3"	5"	2-1/2"
3"	8"	4"	6"	2-1/2"
3-3/4"	10"	5"	7"	2-1/2"
4-1/2"	12"	6"	8"	3"
5-1/4"	14"	7"	10"	3-1/2"
6"	16"	8"	11"	4"



TYPICAL SAWCUT DETAIL

Scale: N.T.S.

Professional Engineer (Civil) CARLA M. HANSON PE 11065 Carla M. Hanson Date 08/04/2025 WYOMING

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

REV.	DATE	2025.02.13
	SURVEYED	
	ENGINEERED	AMB
	DRAWN	AMB
	CHECKED	CMH
	APPROVED	CMH

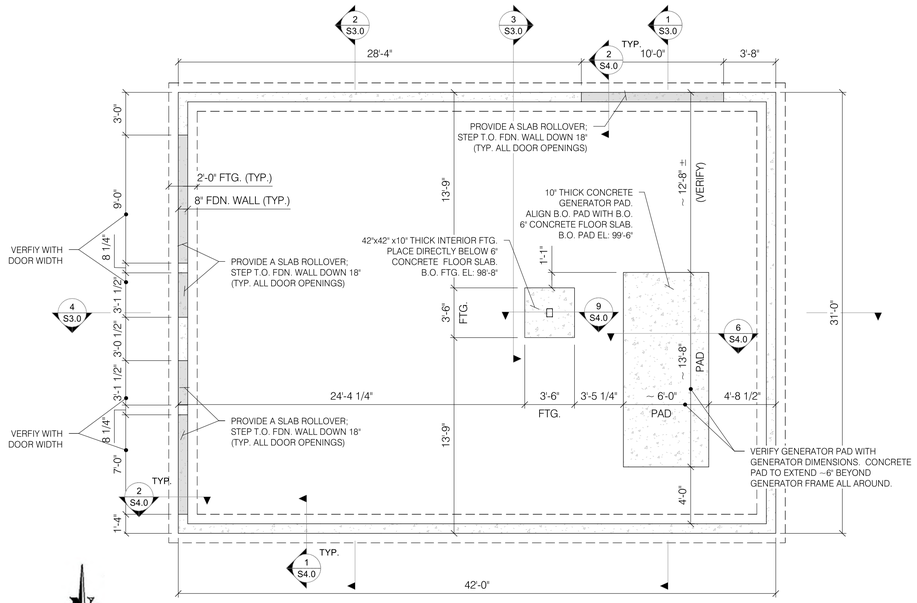
DRAWING TITLE: GENERAL STRUCTURAL DETAILS

JOB TITLE: ToJ HIGH SCHOOL ROAD PUMP HOUSE
TOWN OF JACKSON, WY 83001

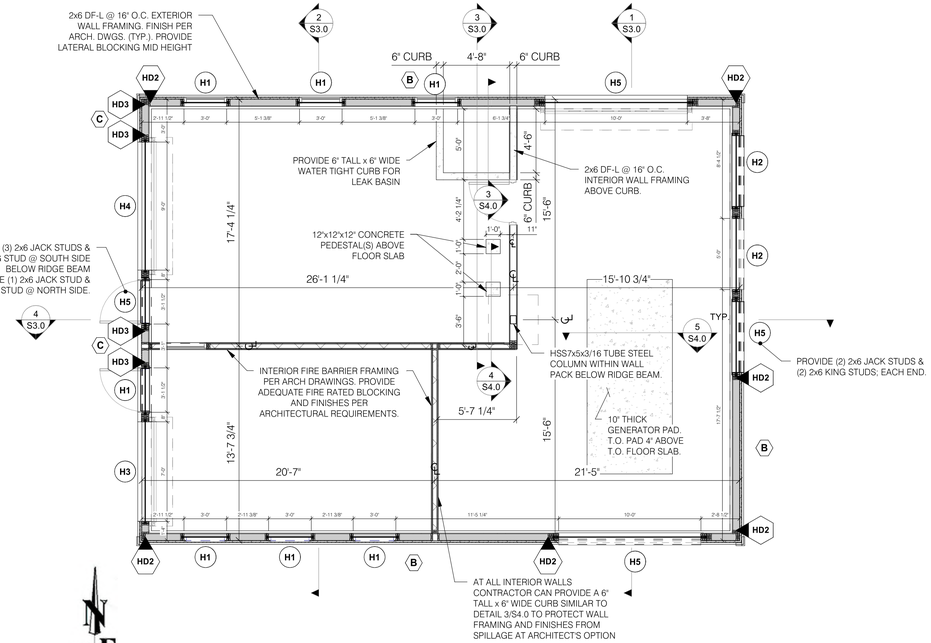
DRAWING NO: S1.1

JOB NO: 23-302-02

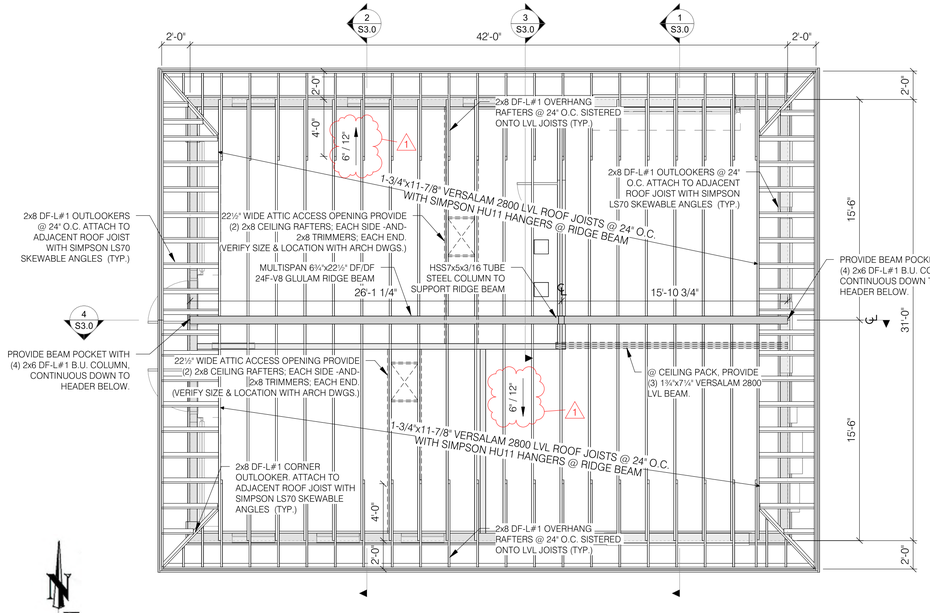
X:\PROJECTS\23-302 ToJ High School Pump House Building Enclosure\1 Drawings\Structural\S1.1 Details - Structural.vwx



1 S2.0 **STRUCTURAL FOUNDATION PLAN**
Scale: 3/16" = 1'-0"



2 S2.0 **STRUCTURAL WALL FRAMING PLAN**
Scale: 3/16" = 1'-0"



3 S2.0 **STRUCTURAL ROOF FRAMING PLAN**
Scale: 3/16" = 1'-0"

SHEARWALL SCHEDULE

MARK	SHEATHING	NAILING	HOLDOWNS EA. END	POST @ HOLDOWN
A	15/32" PLYWOOD	8d @ 6" O.C. BOUNDARY EDGES, 8d @ 12" O.C. INTERIOR	SEE PLAN.	SEE HOLDOWN.
B	15/32" PLYWOOD	10d @ 4" O.C. BOUNDARY EDGES, 10d @ 12" O.C. INTERIOR	SEE PLAN.	SEE HOLDOWN.
C	15/32" PLYWOOD; BOTH SIDES - OR -	10d @ 4" O.C. BOUNDARY EDGES, 10d @ 12" O.C. INTERIOR - OR -	SEE PLAN.	SEE HOLDOWN.

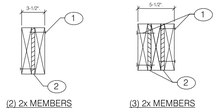
NOTES:
1. ALL EXTERIOR WALLS SHALL BE CONSTRUCTED WITH SHEARWALL "A" UNLESS NOTED OTHERWISE.
2. ALL FRAMED EXTERIOR WALLS AND INTERIOR SHEARWALLS SHALL BE 2x6 @ 16" O.C. UNLESS NOTED OTHERWISE.
3. WHERE PANELS ARE APPLIED ON BOTH FACES OF A SHEAR WALL AND NAIL SPACING IS LESS THAN 6" o.c. ON EITHER SIDE, PANEL JOINTS SHALL BE OFFSET TO FALL ON DIFFERENT FRAMING MEMBERS. ALTERNATIVELY, THE WIDTH OF THE NAILED FACES OF FRAMING MEMBERS SHALL BE 3" NOMINAL OR GREATER AT ADJOINING PANEL EDGES AND NAILS AT ALL PANEL EDGES STAGGERED.

HOLDOWN SCHEDULE

MARK	TYPE	COMMENTS	MINIMUM WOOD MEMBER THICKNESS
HD1	SIMPSON HDU2-SDS2.5 (OR EQUAL)	PROVIDE A SB5/8x24 ANCHOR BOLT, CAST INTO FDN. WALL WITH 18" MIN EMBEDMENT.	3"
HD2	SIMPSON HDU4-SDS2.5 (OR EQUAL)	PROVIDE A SB5/8x24 ANCHOR BOLT, CAST INTO FDN. WALL WITH 18" MIN EMBEDMENT.	3"
HD3	SIMPSON HDU11-SDS2.5 (OR EQUAL)	PROVIDE A SB1x30 ANCHOR BOLT, CAST INTO FDN. WALL WITH 24" MIN EMBEDMENT.	4 1/2"

NOTES:
1. REFER TO SIMPSON CATALOG FOR ALL INSTALLATION & CONNECTION REQUIREMENTS. SIMPSON CATALOG & DESIGN PAGES SHALL BE ON SITE DURING CONSTRUCTION FOR ALL ATTACHMENT REQUIREMENTS.
2. FOUNDATION CONTRACTOR MUST COORDINATE WITH FRAMING CONTRACTOR & STUD WALL PLACEMENT TO ACCURATELY PLACE HOLDOWN ANCHORS. HOLDOWN ANCHORS MUST BE CAST IN PLACE & WILL NOT BE ALLOWED TO DRILL & EPOXY.

HEADER SCHEDULE



KEYNOTES:
1. 16d NAILS, STAGGERED, @ 12" O.C. AS SHOWN.
2. PLYWOOD SPACER, 3" LONG (MIN) STRIP.
3. IN LIEU OF (3) 1¾" BUILT UP LVL MEMBERS; CAN USE A 5¼" WIDE LVL MEMBER WITH SAME DEPTH AS INDICATED IN SCHEDULE.
4. NAIL LVL PLIES TOGETHER SIM. TO NOTE 1; IF MEMBERS ARE ≤ 11⅞" DEPTH.
5. NAIL LVL PLIES TOGETHER WITH (3) ROWS OF 16d NAILS SIM. TO NOTE 1; IF DEPTH > 11⅞"

MARK	HEADER/BEAM	END SUPPORTS/NOTES
H1	(3) 2x6 DF-L#1	(1) 2x6 JACK STUDS & (1) 2x6 KING STUDS EACH END.
H2	(3) 2x6 DF-L#1	(1) 2x6 JACK STUDS & (2) 2x6 KING STUDS EACH END.
H3	(3) 2x8 DF-L#1	(1) 2x6 JACK STUDS & (2) 2x6 KING STUDS EACH END.
H4	(3) 2x10 DF-L#1	(1) 2x6 JACK STUDS & (3) 2x6 KING STUDS EACH END.
H5	(3) 1¾"x11⅞" VERSALAM 2800 LVL	(3) 2x6 JACK STUDS & (3) 2x6 KING STUDS EACH END.

NOTE: SEE WALL FRAMING PLAN FOR HEADERS TO HAVE DIFFERING END SUPPORTS THAN INDICATED IN THIS TABLE

Professional Engineer (Civil) CARLA M HANSEN PE11085 Carla M. Hanson Date 08/04/2025 WYOMING

REV.	DATE
1	8/4/25

DATE	2025.02.13
SURVEYED	
ENGINEERED	AMB
DRAWN	AMB
CHECKED	CMH
APPROVED	CMH

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

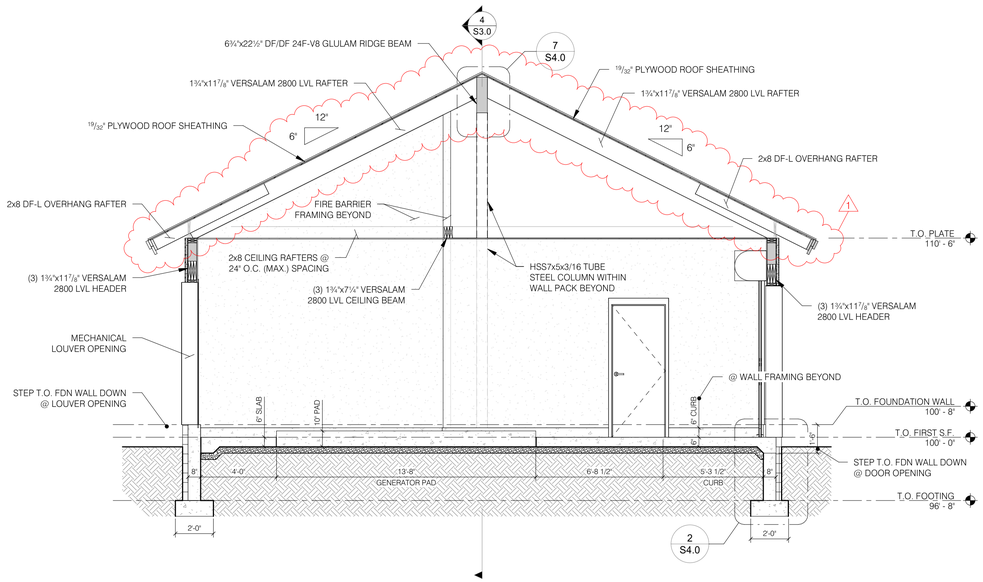
DRAWING TITLE: STRUCTURAL FRAMING PLANS

JOB TITLE: ToJ HIGH SCHOOL ROAD PUMP HOUSE
TOWN OF JACKSON, WY 83001

DRAWING NO: S2.0

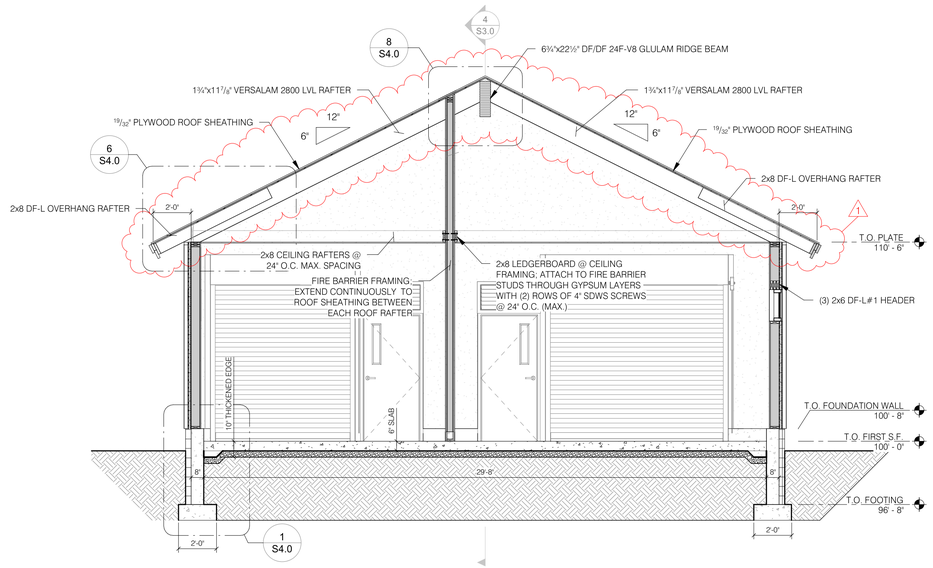
JOB NO: 23-302-02

X:\PROJECTS\C23\23-302 ToJ High School Rd Pump House\Drawings\Structural\23-302 Roof Struc Schedules.pln&ct4



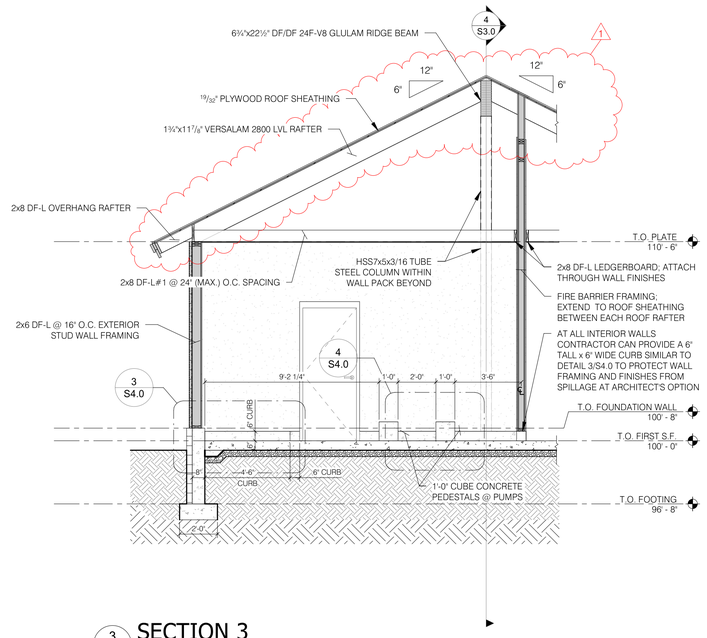
1 S3.0 SECTION 1

Scale: 1/4" = 1'-0"



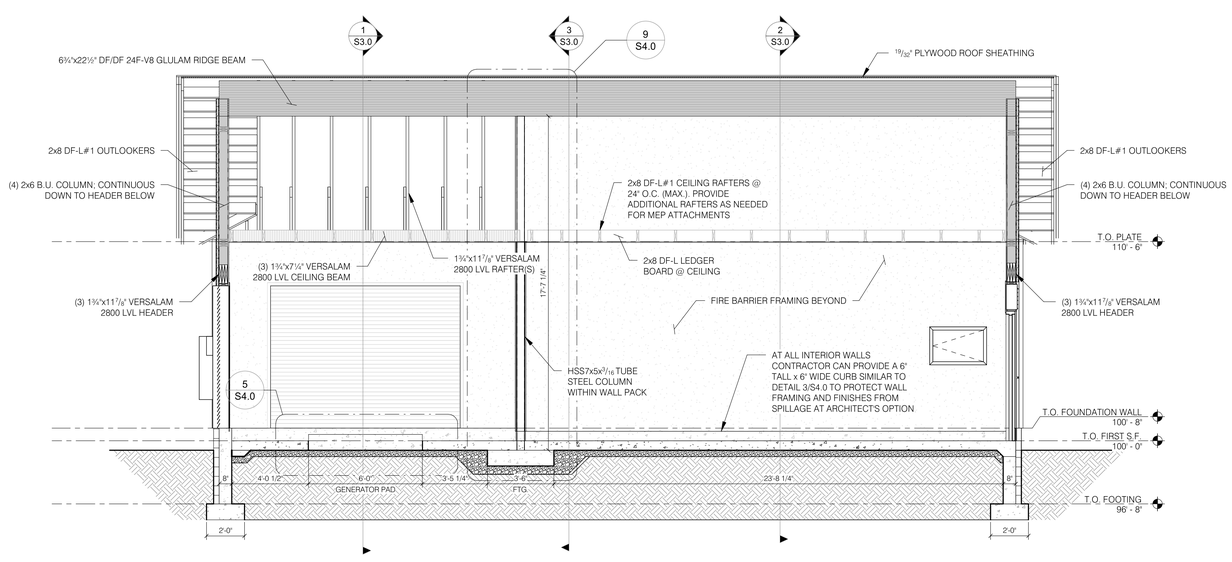
2 S3.0 SECTION 2

Scale: 1/4" = 1'-0"



3 S3.0 SECTION 3

Scale: 1/4" = 1'-0"



4 S3.0 SECTION 4

Scale: 1/4" = 1'-0"

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

REV.	DATE
1	8/4/25
	2025.02.13

SURVEYED	
ENGINEERED	AMB
DRAWN	AMB
CHECKED	CMH
APPROVED	CMH

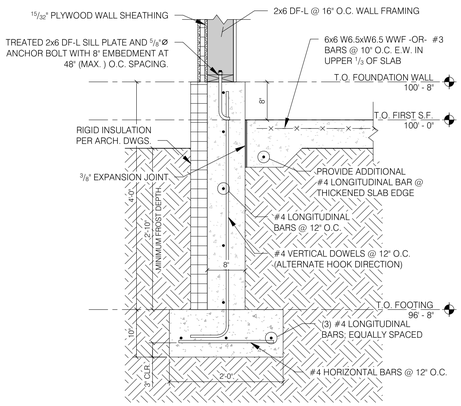
DRAWING TITLE: STRUCTURAL SECTIONS

JOB TITLE: ToJ HIGH SCHOOL ROAD PUMP HOUSE
TOWN OF JACKSON, WY 83001

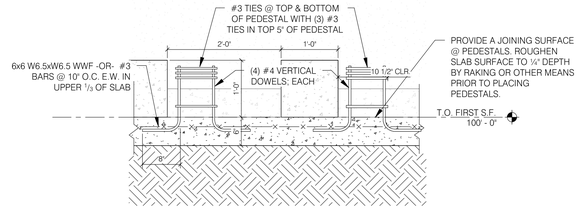
DRAWING NO: S3.0

JOB NO: 23-302-02

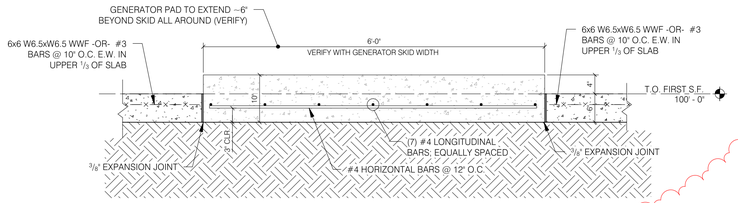
X:\PROJECTS\C23\23-302 High School & Pump Station\3 Drawings\Structural\STR Wall Sheet_Schedule1.pln8x11



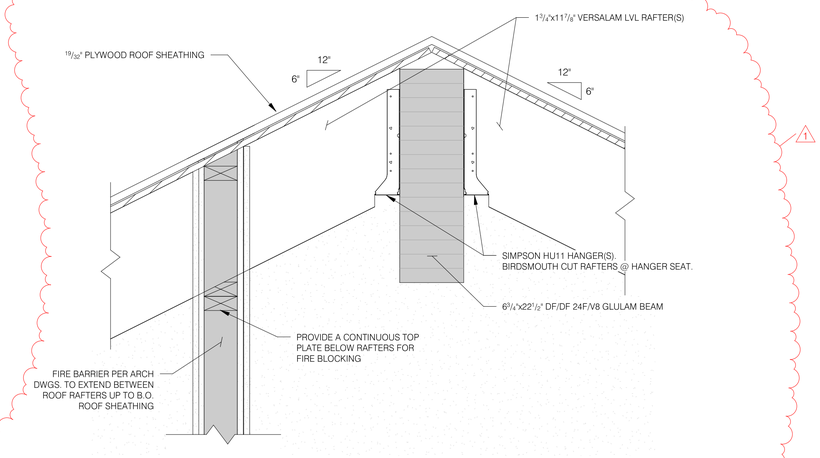
1 S4.0 **TYPICAL FOUNDATION DETAIL**
Scale: 3/4" = 1'-0"



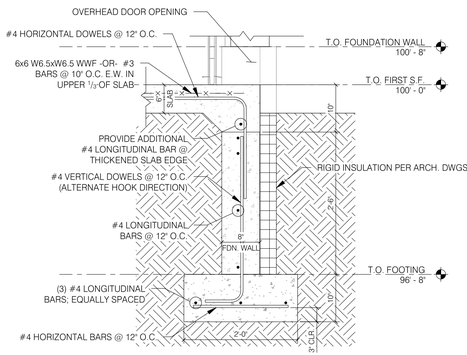
4 S4.0 **PUMP PEDESTAL DETAIL**
Scale: 3/4" = 1'-0"



5 S4.0 **GENERATOR PAD DETAIL**
Scale: 3/4" = 1'-0"



8 S4.0 **FIRE BARRIER DETAIL**
Scale: 1 1/2" = 1'-0"

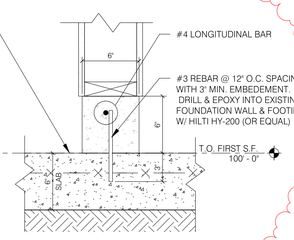


2 S4.0 **SLAB ROLLOVER @ DOOR OPENINGS**
Scale: 3/4" = 1'-0"

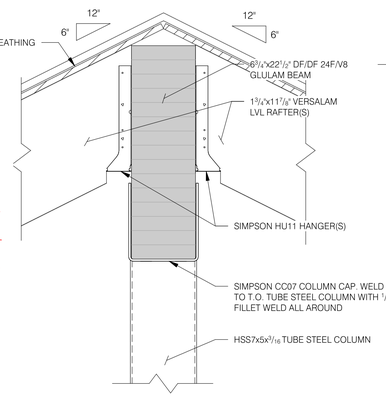
6 S4.0 **OVERHANG RAFTER CONNECTION**
Scale: 3/4" = 1'-0"

COLUMN BASE PLATE
Scale: 1 1/2" = 1'-0"

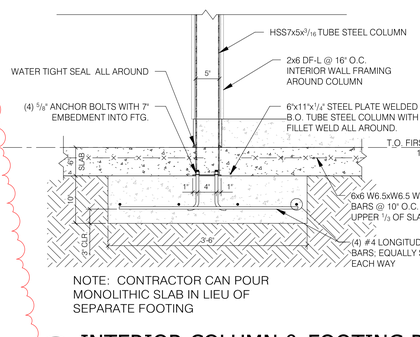
3 S4.0 **LEAK BASIN CURB DETAIL**
Scale: 3/4" = 1'-0"



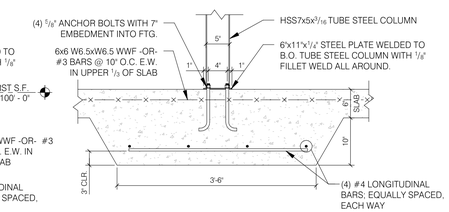
A S4.0 **CURB SECTION**
Scale: 1 1/2" = 1'-0"



7 S4.0 **RIDGE BEAM CONNECTION**
Scale: 1 1/2" = 1'-0"



NOTE: CONTRACTOR CAN POUR MONOLITHIC SLAB IN LIEU OF SEPARATE FOOTING



INTERIOR FOOTING OPTION
Scale: 3/4" = 1'-0"

9 S4.0 **INTERIOR COLUMN & FOOTING DETAIL**
Scale: 3/4" = 1'-0"

Professional Engineer (Civil) CARLA M HANSEN PE 11085 Carla M Hansen Date: 08/04/2025 WYOMING

REV.	DATE
1	8/4/25
	2025.02.13
	SURVEYED
	ENGINEERED AMB
	DRAWN AMB
	CHECKED CMH
	APPROVED CMH

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

JOB TITLE: ToJ HIGH SCHOOL ROAD PUMP HOUSE
TOWN OF JACKSON, WY 83001

DRAWING TITLE: STRUCTURAL FOUNDATION & FRAMING DETAILS

DRAWING NO: S4.0
JOB NO: 23-302-02

C:\PROJECTS\23-302-02 ToJ High School Rd Pump Station\2 Drawings\Structural\Fdn Wall Blocks - Structural1.pln4Sheet

MECHANICAL GENERAL NOTES

1. ALL MECHANICAL EQUIPMENT AND SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH THE 2021 IBC, IMC, 2021 IECC, AND ALL LOCAL & STATE CODES.
2. ALL MECHANICAL EQUIPMENT SHALL BE INSTALLED PER THE MANUFACTURER'S RECOMMENDATIONS.
3. MECHANICAL CONTRACTORS SHALL RECEIVE PRIOR APPROVAL FROM THE STRUCTURAL ENGINEER BEFORE MAKING CUTS THROUGH ANY STRUCTURAL MEMBER.
4. THESE PLANS ARE SCHEMATIC IN NATURE AND MECHANICAL CONTRACTOR SHALL COORDINATE INSTALLATION WITH CONSTRUCTION SUPERVISOR AND WITH ALL OTHER TRADES TO AVOID CONFLICTS.
5. IT SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR TO REVIEW THE DRAWINGS FOR ALL DISCIPLINES AND PROVIDE LABOR AND MATERIALS REQUIRED FOR A COMPLETE INSTALLATION.
6. THE MECHANICAL CONTRACTORS SHALL VERIFY MOTOR VOLTAGES WITH THE ELECTRICAL DRAWINGS BEFORE ORDERING MOTORIZED EQUIPMENT AND CONTROLS.
7. ALL PROPOSED MECHANICAL EQUIPMENT SHALL BE ON THE APPROVED LIST PRIOR TO SUBMITTALS. ALL APPROVED MANUFACTURERS MUST BE CAPABLE OF MEETING THE REQUIREMENTS OF THE SPECIFIED EQUIPMENT.
8. PAINT ALL VTR'S, FLUES, EXHAUST CAPS, AND OTHER MECHANICAL ITEMS ON THE ROOF TO MATCH THE ROOF COLOR.
9. INSULATED FLEXIBLE DUCTWORK MAY BE USED FOR RUNOUTS TO GRILLES AND DIFFUSERS, IN LENGTHS OF 5'-0" OR LESS.
10. MAINTAIN MINIMUM OF 10'-0" DISTANCE BETWEEN ALL FRESH AIR INTAKES AND EXHAUST OR GAS FLUE DISCHARGES.
11. LOCATE ACCESS HATCHES SO AS TO PROVIDE OPTIMUM SERVICEABILITY TO EQUIPMENT AND/OR VALVING. SEE ARCHITECTURAL SPECIFICATION FOR TYPE AND COLOR. COORDINATE LOCATION WITH STRUCTURAL & LIGHTING.
12. WHENEVER THERE IS A DISCREPANCY BETWEEN THE RUNOUT DUCT SIZE SHOWN ON THE PLANS AND THAT SHOWN IN THE SCHEDULE, ALWAYS USE THE LARGER OF THE TWO DUCT SIZES.
13. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR VERIFICATION OF EXISTING JOB CONDITIONS PRIOR TO BID. NO ADDITIONAL COST SHALL BE AWARDED TO THE SUCCESSFUL CONTRACTOR (OR THEIR SUBCONTRACTORS) AFTER BIDS HAVE BEEN SUBMITTED AND CONTRACTS AWARDED FOR FAILURE TO VERIFY EXISTING FIELD CONDITIONS. DISCREPANCIES BETWEEN ACTUAL FIELD CONDITIONS AND CONTRACT DOCUMENTS SHALL BE BROUGHT TO THE ENGINEERS ATTENTION FOR ALTERNATIVE METHODS OF INSTALLATION PRIOR TO THE BIDDING OF THIS PROJECT.
14. UNLESS OTHERWISE NOTED ALL EXISTING MECHANICAL EQUIPMENT, PIPING, ETC, TO BE REMOVED SHALL BE DISPOSED OF BY THE CONTRACTOR UNDER THIS CONTRACT. THE OWNER SHALL RETAIN THE RIGHT TO KEEP ANY REMOVED ITEMS.
15. ALL HEAT EXCHANGERS SHALL BE PIPED IN COUNTERFLOW ORIENTATION.
16. UNLESS OTHERWISE INDICATED ALL DUCTWORK SHOULD HAVE ACCOUSTIC LINING WITHIN 10' OF EQUIPMENT.
17. ALL DUCTWORK SHOWN IS TO BE ROUTED BETWEEN FINISHED FLOOR OF ASSOCIATED LEVEL AND FINISH FLOOR OF LEVEL ABOVE.
18. ALL EQUIPMENT SHOWN IS TO BE LOCATED BETWEEN FINISHED FLOOR OF ASSOCIATED LEVEL AND FINISHED FLOOR OF LEVEL ABOVE. AIR TERMINALS WITH TAGS ARE SERVING THE PLAN'S ASSOCIATED LEVEL.
19. MECHANICAL EQUIPMENT LOCATED IN CEILING OR ATTIC SHALL INCLUDE A UL508 LISTED WATER DETECTION DEVICE IN THE DRAIN PAN THAT WILL SHUT THE EQUIPMENT OFF IN THE EVENT THE DRAIN IS PLUGGED OR PUMP BECOMES NON FUNCTIONAL.
20. REFERENCE ARCHITECTURAL LIGHTING PLANS FOR EXACT EXHAUST FAN AND DIFFUSER LOCATIONS.
21. RADIANT MANIFOLDS TO BE LOCATED WITHIN TEN FEET OF ZONE.
22. THERMOSTATS AND SENSORS TO BE LOCATED ON UNOCCUPIED AREA OF WALL, FREE FROM ARTWORK AND WALL HANGINGS. FINAL LOCATION SHALL BE COORDINATED WITH ARCHITECT.
23. GENERAL CONTRACTOR TO PROVIDE ACCESS PANELS FOR RADIANT AND SNOWMELT MANIFOLDS.

ENERGY CODE COMPLIANCE

1. COMPLIANCE WITH THE 2021 IECC. THESE NOTES COVER MANDATORY REQUIREMENTS OF THE CODE. ADDITIONAL REQUIREMENTS ARE NOTED ON THE PLANS AND IN THE SPECIFICATIONS.
2. MINIMUM REQUIREMENTS FOR SUPPLY AND RETURN DUCTWORK INSULATION:
   A. R-6: DUCTS LOCATED IN UNCONDITIONED SPACES
   B. R-8: DUCTS LOCATED OUTSIDE OF THE BUILDING'S INSULATION ENVELOPE (SUCH AS ABOVE THE ATTIC INSULATION)
3. CONTRACTOR SHALL VERIFY WITH THE MANUFACTURER, THE R-VALUES OF THE ACTUAL INSULATION USED. R-VALUES SHALL BE INSTALLED VALUES.
4. WHERE DUCTS USED FOR COOLING ARE EXTERNALLY INSULATED, THE INSULATION SHALL BE COVERED WITH A VAPOR RETARDER HAVING A MAXIMUM PERMEANCE OF 0.05 PERM OR ALUMINUM FOIL HAVING A MINIMUM THICKNESS OF 2 MILS, INSULATION HAVING A PERMANCE OF 0.05 PERMS OR LESS SHALL NOT BE REQUIRED TO BE COVERED. ALL JOINTS AND SEAMS SHALL BE SEALED TO MAINTAIN THE CONTINUITY OF THE VAPOR RETARDER.
5. ALL DUCT JOINTS, SEAMS, AND CONNECTIONS SHALL BE FASTENED AND SEALED WITH WELDS, GASKETS, ADHESIVES, MASTIC-PLUS-EMBEDDED-FABRIC SYSTEMS, OR TAPES, TAPES AND MASTICS SHALL BE LISTED AND LABELED PER UL181A OR UL181B. DUCT TAPE IS NOT PERMITTED AS A SEALANT ON ANY METAL DUCTS, DUCT CONNECTIONS TO FLANGES OR EQUIPMENT SHALL BE SEALED AND MECHANICALLY FASTENED.
6. MINIMUM REQUIREMENTS (THICKNESS) FOR PIPING INSULATION SHALL BE AS FOLLOWS:

FLUID	NOMINAL PIPE DIAMETER	INSULATION R-VALUE
DOMESTIC WATER	ANY SIZE	R-3
HOT/CHILLED WATER	ANY SIZE	R-3
REFRIGERANT	ANY SIZE	R-3

   THE ABOVE INSULATION IS BASED ON HAVING A CONDUCTIVITY NOT EXCEEDING 0.27 BTU-INCH/HOUR-FT2-°F
7. AN OPERATING AND MAINTENANCE MANUAL SHALL BE PROVIDED PRIOR TO ISSUANCE OF A CERTIFICATE OF OCCUPANCY. THE O&M MANUAL SHALL CONTAIN THE FOLLOWING:
   A. EQUIPMENT CAPACITY (INPUT & OUTPUT)
   B. EQUIPMENT OPERATING AND MAINTENANCE INSTRUCTIONS
   C. CONTROL SYSTEM MAINTENANCE AND CALIBRATION INFORMATION, INCLUDING WIRING DIAGRAMS, SCHEMATICS, AND CONTROL SEQUENCES
   D. CONTROL SYSTEM SETPOINTS SHALL BE SHOWN ON CONTROL DRAWINGS, AT CONTROL DEVICES
   E. A COMPLETE WRITTEN NARRATIVE ON HOW EACH MECHANICAL SYSTEM IS INTENDED TO OPERATE

MECHANICAL LEGEND

- SUPPLY AIR SHEET METAL DUCT
- RETURN AIR SHEET METAL DUCT
- EXHAUST AIR SHEET METAL DUCT
- OUTSIDE AIR SHEET METAL DUCT
- ACOUSTICAL OR INT. LINED DUCT
- INSULATED DUCT
- 12x8 — DUCT SIZE RECTANGULAR (1ST FIGURE = FACING SIDE)
- 12Ø — DUCT SIZE ROUND (DIAMETER)
- ELBOW WITH TURNING VANES
- FLEXIBLE ROUND DUCT
- VERTICAL SUPPLY DUCT
- VERTICAL RETURN DUCT
- VERTICAL EXHAUST DUCT
- VERTICAL OUTSIDE AIR DUCT
- SUPPLY AIR FLOW DIRECTION
- RETURN / EXHAUST AIR FLOW
- SG-1 / 100 — DIFFUSER / GRILLE NAME CFM AIR FLOW

- THERMOMETER / TEMP GAUGE
- BALL/ISOLATION VALVE
- CHECK VALVE
- BUTTERFLY VALVE
- MANUAL BALANCING VALVE
- STRAINER
- REDUCER
- M — 2 WAY MOTOR OPERATED VALVE
- M — 3 WAY MOTOR OPERATED VALVE
- S — SOLENOID VALVE
- AUTOMATIC BALANCE VALVE
- BACKFLOW PREVENTER ASSEMBLY
- PRESSURE REDUCING VALVE
- PRESSURE REGULATOR VALVE
- SAFETY VALVE
- HEATING WATER SUPPLY (HWS)
- HEATING WATER RETURN (HWR)
- CHILLED WATER SUPPLY (CHWS)
- CHILLED WATER RETURN (CHWR)
- GROUND WATER SUPPLY (GWS)
- GROUND WATER RETURN (GWR)

- MANUAL DAMPER
- E — MOTORIZED DAMPER
- ⅛ — FIRE / SMOKE DAMPER
- T 3 — THERMOSTAT WITH ZONE
- H T 3 — HUMIDISTAT & THERMOSTAT WITH ZONE
- H — HUMIDISTAT
- FS — FLOOR / SLAB SENSOR WITH ZONE
- S — SENSOR LOCATION - SEE DWGS
- DS — DUCT SMOKE DETECTOR
- CO2 — CARBON DIOXIDE SENSOR
- CO — CARBON MONOXIDE SENSOR

*NOTE: ITEMS ON LEGEND MAY NOT ALWAYS BE USED. REFERENCE PROJECT SPECIFICATIONS FOR APPROVED MATERIALS.

GENERAL SYMBOLS

- 1 — KEYED NOTE
- A/1 — GENERAL NOTES
- X / XX — EQUIPMENT TAG / EQUIPMENT NUMBER
- X / XX — SECTION REFERENCE NUMBER / SECTION REFERENCE SHEET
- X / XX — DETAIL REFERENCE NUMBER / DETAIL REFERENCE SHEET
- POINT OF NEW CONNECTION (POC)
- POINT OF DISCONNECT (POD)

SHEET LIST - MECHANICAL

M0.0	MECHANICAL COVER SHEET
M0.1	MECHANICAL SPECIFICATIONS
M0.3	MANUAL J, S
M1.0	MAIN LEVEL FORCED AIR PLAN
M2.0	MECHANICAL DETAILS AND CONTROL SEQUENCES
M3.0	MECHANICAL SCHEDULES

MECHANICAL ABBREVIATIONS LEGEND

(E)	EXISTING
(X)	DEMOLISH / REMOVE
(R)	RELOCATE
(N)	NEW
ACU	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
ARCH	ARCHITECT or ARCHITECTURE
AHU	AIR-HANDLING UNIT
ASSY	ASSEMBLY
ATM	ATMOSPHERE
AHJ	AUTHORITY HAVING JURISTICTION
AVG	AVERAGE
BAS	BUILDING AUTOMATION SYSTEM
BDD	BACKDRAFT DAMPER
BLDG	BUILDING
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BTU	BRITISH THERMAL UNIT
CC	COOLING COIL
CFH	CUBIC FEET PER HOUR
CFM	CUBIC FEET PER MINUTE
CHWR	CHILLED WATER RETURN
CHWS	CHILLED WATER SUPPLY
CLG	CEILING
CONC	CONCRETE
CTE	CONNECT TO EXISTING
CONN	CONNECTION
CONT	CONTINUATION
CO	CLEAN OUT
CU	CONDENSING UNIT
DDC	DIRECT DIGITAL CONTROL
DAD	DUCT ACCESS DOOR
DB	DRY BULB
DIM	DIMENSION
DN	DOWN
DWG	DRAWING
DX	DIRECT EXPANSION
EA	EXHAUST AIR
EAT	ENTERING AIR TEMPERATURE
EF	EXHAUST FAN
EG	EXHAUST GRILLE
ELEV	ELEVATION
ERC	ELECTRIC REHEAT COIL
ESP	EXTERNAL STATIC PRESSURE
EVAP	EVAPORATOR
EWT	ENTERING WATER TEMPERATURE
EX	EXHAUST
EXP	EXPANSION
FC	FORWARD CURVED
FCO	FLOOR CLEAN OUT
FCU	FAN COIL UNIT
FD	FLOOR DRAIN
F/D	FIRE DAMPER
FSD	FIRE SMOKE DAMPER
FF	FINISHED FLOOR
FLEX	FLEXIBLE
FPM	FEET PER MINUTE
FUT	FUTURE
GWR	GROUND WATER RETURN
GWS	GROUND WATER SUPPLY
IJS	IN JOIST SPACE
HWC	HOT WATER COIL
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
LPG	LIQUID PROPANE GAS
LWT	LEAVING WATER TEMPERATURE
NG	NATURAL GAS
OA	OUTSIDE AIR
POC	POINT OF CONNECTION
RA	RETURN AIR
RG	RETURN GRILLE
SA	SUPPLY AIR
SG	SUPPLY GRILLE
SMS	SNOWMELT SUPPLY
SMR	SNOWMELT RETURN
TA	TRANSFER AIR
TG	TRANSFER GRILLE
TJS	THROUGHT JOIST SPACE
VAV	VARIABLE AIR VOLUME
VFD	VARIABLE FREQUENCY DRIVE

Professional Engineer — NOAM HAWKINS — 14811 — Date — WYOMING

04/16/2025

#	Revisions — Description	Date

Drawing Title MECHANICAL COVER SHEET
Date 2025.04.16

Mechanical: Engineering LLC
David Majid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil: Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural: Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client: TOWN OF JACKSON

Project: POWELL SCHOOL ROAD PUMP HOUSE

Architect: Alliance, LLC
mail PO Box 4055 Jackson, WY 83001
office 610 W Broadway Ave #103 Jackson, WY 83001
phone 307.249.8650

M0.0

MECHANICAL AND PLUMBING SPECIFICATIONS

GENERAL

1. EXAMINE AND REFER TO ALL ARCHITECTURAL, CIVIL, STRUCTURAL, ELECTRICAL, UTILITY, LANDSCAPE AND MECHANICAL DRAWINGS AND SPECIFICATIONS FOR CONSTRUCTION CONDITIONS WHICH MAY AFFECT THE MECHANICAL WORK. INSPECT THE BUILDING SITE AND EXISTING FACILITIES FOR VERIFICATION OF PRESENT CONDITIONS. MAKE PROPER PROVISIONS FOR THESE CONDITIONS IN PERFORMANCE OF THE WORK AND COST THEREOF.
2. ALL WORK ON THE PROJECT SHALL CONFORM TO ALL LOCAL CITY, STATE AND NATIONAL CODES AND REGULATIONS, INCLUDING BUT NOT LIMITED TO THE N.F.P.A, N.E.C., I.B.C., I.E.C.C., I.M.C., U.P.C. OR I.P.C AS APPLICABLE, THE LOCAL UTILITY SERVING COMPANIES AND THE AUTHORITY HAVING JURISDICTION.
3. THE MECHANICAL AND ELECTRICAL CONTRACTORS SHALL BE RESPONSIBLE FOR AND PAY FOR ALL FEES AND PERMITS REQUIRED FOR WORK UNDER THEIR CONTRACT AND UNDER THEIR SUPERVISION BY SUBCONTRACT.
4. ALL USAGE CONTRACTS BETWEEN THE OWNER AND THE SERVING UTILITIES COMPANY, SUCH AS MEMBERSHIP AND USAGE CHARGES OR FEES, ETC., FOR THE PURPOSE OF OBTAINING THE SERVICES FOR THE UTILITY COMPANY SHALL BE APPLIED FOR AND PAID FOR BY THE OWNER.
5. SMOKING SHALL NOT BE PERMITTED ANYWHERE IN THIS FACILITY.

BIDDING AND SUBSTITUTIONS

1. THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, ITEMS, ARTICLES, OPERATIONS AND METHODS LISTED, SHOWN, SCHEDULED, MENTIONED OR IMPLIED IN THE DRAWINGS, AND/OR SPECIFIED, INCLUDING ALL INCIDENTALS REQUIRED FOR THEIR COMPLETION.
2. WRITTEN PRIOR APPROVAL FOR SUBSTITUTIONS MUST BE SUBMITTED TO AND RECEIVED BY THE ARCHITECT/ENGINEER TEN (10) DAYS PRIOR TO BID OPENING. REQUESTS FOR SUBSTITUTION ARE TO BE SUBMITTED SUFFICIENTLY AHEAD OF THE DEADLINE TO GIVE AMPLE TIME FOR EXAMINATION. PRIOR APPROVAL REQUEST FOR SUBSTITUTION MUST INDICATE THE SPECIFIC ITEM OR ITEMS TO BE FURNISHED IN LIEU OF THOSE SCHEDULED, TOGETHER WITH COMPLETE TECHNICAL AND COMPARATIVE DATA ON SCHEDULED ITEMS AND ITEMS PROPOSED FOR SUBSTITUTION.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT A SUBSTITUTE ITEM SHALL FIT INTO THE SPACE ALLOCATED AND THAT THE ITEM CAN BE INSTALLED AND FUNCTION AS INTENDED. SHOULD CHANGES IN THE WORK OF ANY CONTRACTOR BECOME NECESSARY AS A RESULT OF ANY SUBSTITUTE ITEM SUCH CHANGES SHALL BE ARRANGED AND PAID FOR BY THIS CONTRACTOR.

REVIEW & SITE INSPECTIONS

1. ALL WORK AND MATERIAL ARE SUBJECT TO REVIEW AT ANY TIME BY THE ARCHITECT/ENGINEER OR THEIR REPRESENTATIVE. IF THE ARCHITECT/ENGINEER OR THEIR REPRESENTATIVE FINDS MATERIAL THAT DOES NOT CONFORM TO THESE SPECIFICATIONS OR THAT IS NOT PROPERLY INSTALLED OR FINISHED, CORRECT THE DEFICIENCIES IN A MANNER SATISFACTORY TO THE ARCHITECT/ENGINEER AT THE CONTRACTOR'S EXPENSE.
2. THE CONTRACTOR SHALL INFORM THE GENERAL CONTRACTOR OF THE PROJECT PROGRESS AND SCHEDULE WEEKLY. THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT EACH OF THE FOLLOWING POINTS:
   A. AT THE COMPLETION OF UNDERSLAB PIPING AND UTILITIES PRIOR TO BEING COVERED.
   B. AT THE COMPLETION OF ROUGH-IN BEFORE INSULATION/WALL/FLOOR SURFACES ARE INSTALLED.
   C. AT SUBSTANTIAL COMPLETION WHEN ALL SYSTEMS ARE OPERATIONAL. (PUNCH LIST DEVELOPMENT)

INTENT OF DRAWINGS

1. THE DRAWINGS ARE PARTLY DIAGRAMMATIC AND DO NOT NECESSARILY SHOW EXACT LOCATION OF PIPING AND DUCTWORK UNLESS SPECIFICALLY DIMENSIONED. RISER AND OTHER DIAGRAMS ARE SCHEMATIC AND DO NOT NECESSARILY SHOW THE PHYSICAL ARRANGEMENT OF THE EQUIPMENT. THEY SHALL NOT BE USED FOR OBTAINING LINEAL RUNS OF PIPING OR DUCTWORK. NOR SHALL THEY BE USED FOR SHOP DRAWINGS FOR PIPING AND DUCTWORK FABRICATION OR ORDERING. DISCREPANCIES SHOWN ON DIFFERENT PLANS, OR BETWEEN PLANS AND ACTUAL FIELD CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT/ENGINEER FOR RESOLUTION.

REQUEST FOR INFORMATION (RFI'S)

1. RFI'S SHALL BE USED TO RESOLVE CONFLICTS, PROVIDE CLARITY TO THE INTENT OF DRAWINGS, OR REQUEST ADDITIONAL DETAIL. RFI'S SHALL INCLUDE A SKETCH OR EQUIVALENT DESCRIPTION OF CONTRACTOR'S PROPOSED SOLUTION. RFI'S SHALL BE MADE ELECTRONICALLY AND BE RETURNED TO THE CONTRACTOR BY THE ENGINEER WITHIN 14 BUSINESS DAYS.

RESPONSIBILITY

1. THE MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF A SATISFACTORY AND COMPLETE SYSTEM IN ACCORDANCE WITH THE INTENT OF THE DRAWING AND SPECIFICATIONS. HE/SHE SHALL PROVIDE, AT NO EXTRA COST, ALL INCIDENTAL ITEMS, MATERIALS, ACCESSORIES AND LABOR REQUIRED FOR COMPLETION OF THE WORK EVEN THOUGH THEY ARE NOT SPECIFICALLY MENTIONED OR INDICATED ON THE DRAWINGS OR IN THE SPECIFICATIONS.
2. THE DRAWINGS DO NOT ATTEMPT TO SHOW COMPLETE DETAILS OF THE BUILDING CONSTRUCTION WHICH AFFECT THE MECHANICAL INSTALLATION. REFERENCE IS THEREFORE REQUIRED TO THE ARCHITECTURAL, CIVIL, STRUCTURAL, LANDSCAPE AND ELECTRICAL DRAWINGS AND SPECIFICATIONS AND TO SHOP DRAWINGS OF ALL TRADES FOR ADDITIONAL DETAILS WHICH AFFECT THE INSTALLATION OF THE WORK COVERED UNDER THIS DIVISION OF THE CONTRACT.
3. THE LOCATION OF ALL MECHANICAL SYSTEM COMPONENTS SHALL BE CHECKED FOR CONFLICTS WITH OPENINGS, STRUCTURAL MEMBERS AND COMPONENTS OF OTHER SYSTEMS HAVING FIXED LOCATIONS PRIOR TO FABRICATION AND INSTALLATION OF EQUIPMENT. THE CONTRACTOR SHALL VISIT THE SITE AFTER COMPLETION OF FRAMING TO VERIFY DUCTWORK, PIPING, AND EQUIPMENT SHALL FIT AS PLANNED. ALL CONFLICTS FOUND BY THE CONTRACTOR SHALL BE SUBMITTED TO THE ARCHITECT AND ENGINEER AND CHANGES SHALL BE MADE AT THE CONTRACTOR'S EXPENSE.
4. ALL MODIFICATIONS AND CHANGES REQUIRED DUE TO INSTALLATION OF EQUIPMENT OTHER THAN THE EQUIPMENT SCHEDULED AND SPECIFIED SHALL BE MADE AT THE CONTRACTOR'S EXPENSE. THIS INCLUDES WORK BY OTHER TRADES. IF THE INSTALLATION OF EQUIPMENT OTHER THAN THE SCHEDULED AND SPECIFIED EQUIPMENT REQUIRES MODIFICATIONS TO STRUCTURE, ELECTRICAL SYSTEMS, PLUMBING SYSTEMS, FIRE PROTECTION OR FIRE ALARM SYSTEMS, ANY AND ALL CHANGES SHALL BE MADE AT THE MECHANICAL CONTRACTOR'S EXPENSE.
5. THE CONTRACTOR SHALL INCLUDE VIBRATION ISOLATION AND NOISE REDUCTION EQUIPMENT FOR ALL EQUIPMENT TO MITIGATE ANY VIBRATION AND OBJECTIONABLE EQUIPMENT NOISE FROM EQUIPMENT INSTALLED BY THE CONTRACTOR. THIS INCLUDES FLEXIBLE HOSES, SPRING ISOLATION, RUBBER PADS, FLEXIBLE DUCT CONNECTIONS AND ANY OTHER DEVICES REQUIRED.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR WORK AND EQUIPMENT UNTIL FINAL INSPECTION, PUNCH LIST COMPLETION, START-UP, AND TESTING HAVE BEEN COMPLETED. THE CONTRACTOR SHALL CLOSE OPEN ENDS OF WORK WITH TEMPORARY COVERS AND CORRECT ANY DAMAGE INCURRED DURING COURSE OF CONSTRUCTION AT NO EXTRA COST.
7. THE CONTRACTOR SHALL PROVIDE ALL INCIDENTAL ELECTRICAL INTERCONNECTIONS AND CONTROL WIRING NECESSARY FOR SYSTEM COMPLETION.
8. THE CONTRACTOR SHALL BE CAREFUL NOT TO BLOCK ANY PATHS OF EGRESS WHILE PERFORMING THE WORK SPECIFIED.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANUP OF ALL MATERIALS RESULTING FROM HIS/HER WORK. CLEANUP SHALL BE PERFORMED TO THE LEVEL OF ACCEPTANCE OF THE OWNER'S REPRESENTATIVE AND THE ENGINEER.
10. THE CONTRACTOR SHALL AND HEREBY DOES WARRANT AND GUARANTEE THAT ALL WORK EXECUTED UNDER HIS/HER CONTRACT SHALL BE FREE OF DEFECTS OF MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE(1) YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION.

SHOP DRAWINGS AND SUBMITTALS

1. THE CONTRACTOR SHALL PROCURE MANUFACTURER'S LITERATURE AND/OR CERTIFIED SUBMITTAL PRINTS FOR ALL EQUIPMENT AND MATERIALS REQUIRED FOR THE PROJECT. SHOP DRAWINGS AND LITERATURE SHALL BE COMPLETE AND MARKED SHOWING NAME OF JOB, ITEM USED, SIZE, DIMENSIONS, PERFORMANCE, ETC., AS REQUIRED FOR COMPLETE CHECK AND INSTALLATION. THIS INCLUDES BUT IS NOT LIMITED TO:
   A. SCHEDULED MECHANICAL EQUIPMENT
   B. HYDRONIC PIPING MATERIALS
   C. GRILLES REGISTERS AND DIFFUSERS
   D. PLUMBING FIXTURES AND TRIM
   E. DOMESTIC WATER HEATERS AND ASSOCIATED ACCESSORIES
   F. DOMESTIC WATER PIPING, SANITARY WASTE AND VENT PIPING
2. ALL SUBMITTALS SHALL CLEARLY INDICATE THE EQUIPMENT IT REPRESENTS WITH LABELS OF THE EQUIPMENT IDENTIFICATION ABBREVIATION FOUND ON THE DRAWINGS. LITERATURE SHOWING MORE THAN ONE ITEM SHALL BE CLEARLY MARKED AS TO WHICH ITEM IS BEING FURNISHED OR THE SUBMITTAL WILL BE REJECTED AND RETURNED WITHOUT REVIEW.
3. SUBMIT ACTUAL INSTALLATION LAYOUT DRAWINGS ON FLOOR PLANS SHOWING PIPE AND DUCT RUNS INCLUDING DRAWINGS FOR UNDERGROUND WORK AND BOILER FLUE SYSTEMS.
4. APPROVAL OR REVIEW OF SUBMITTALS SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR DEVIATIONS FROM DRAWINGS, SPECIFICATIONS, OR ERRORS IN SUBMITTAL LITERATURE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE MATERIALS AND EQUIPMENT WHICH MEET THE SPECIFICATIONS AND JOB REQUIREMENTS.
5. SUBMITTALS SHALL BE MADE IN ELECTRONIC PDF FORMAT.

STARTUP, TESTING AND OWNER TRAINING

1. WHEN THE PROJECT HAS REACHED SUBSTANTIAL COMPLETION AND IS CLEAR OF CONSTRUCTION DEBRIS AND DUST, THE CONTRACTOR SHALL STARTUP AND TEST ALL EQUIPMENT ACCORDING TO MANUFACTURER'S REQUIREMENTS. ALL START-UP DOCUMENTATION SHALL BE INCLUDED IN THE OPERATIONS AND MAINTENANCE MANUAL.
2. THE CONTRACTOR SHALL ENGAGE A FACTORY AUTHORIZED REPRESENTATIVE TO CONDUCT AN INSPECTION OF THE INSTALLATION OF THEIR COMPANY'S EQUIPMENT PRIOR TO START-UP OF ANY EQUIPMENT. THE REPRESENTATIVE SHALL SUBMIT A REPORT IDENTIFYING ANY DEFICIENCIES TO THE ARCHITECT, ENGINEER AND CONSTRUCTION MANAGER. ANY DEFICIENCIES IDENTIFIED SHALL BE ADDRESSED PRIOR TO START-UP. START-UP SHALL BE CONDUCTED BY A FACTORY AUTHORIZED REPRESENTATIVE. START-UP REPORTS SHALL BE SUBMITTED TO THE ARCHITECT AND ENGINEER ONCE COMPLETED.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR TESTING ALL NEW AIR AND WATER SYSTEMS COMPLETELY, AND BALANCING TO THE SATISFACTION OF THE ENGINEER IN ACCORDANCE WITH THE STANDARDS OF NEBB. THIRD PARTY TAB CONTRACTORS MAY BE USED AT CONTRACTOR'S EXPENSE WITH PRIOR APPROVAL OF THE ENGINEER.
4. EACH SYSTEM SHALL BE TESTED UNDER NORMAL OPERATING OR SIMULATED CONDITIONS PROVING PROPER OPERATION OF ALL SEQUENCES, SET-POINTS, INTERLOCKS, AND SAFETIES.
5. THE MECHANICAL CONTRACTOR SHALL PROVIDE 2 DAYS (16 HRS) OF TRAINING TO THE OWNER TO ENSURE THE OWNER KNOWS HOW TO OPERATE THE SYSTEMS INSTALLED UNDER THE MECHANICAL CONTRACT. THE MECHANICAL CONTRACT SHALL INCLUDE AN ADDITIONAL 2 DAYS (16 HRS) OF ADDITIONAL SERVICE THROUGH THE FIRST YEAR OF OPERATION TO ADDRESS QUESTIONS THAT MAY ARISE.

OPERATIONS AND MAINTENANCE MANUAL

1. THE CONTRACTOR SHALL PROVIDE TWO PHYSICAL COPIES AND AN ELECTRONIC PDF COPY OF THE OPERATIONS AND MAINTENANCE MANUAL.
2. THE OPERATIONS AND MAINTENANCE MANUAL SHALL INCLUDE COPIES OF ALL BROCHURES OF EQUIPMENT, MATERIAL USED, SHOP DRAWINGS, AS-BUILTS, START-UP AND TESTING DOCUMENTATION AND SERVICE CONTACT INFORMATION SHALL BE PROVIDED IN THE OPERATIONS AND MAINTENANCE MANUAL.

CUTTING, PATCHING, AND REPAIRING

1. CUTTING, PATCHING, AND REPAIRING REQUIRED BY THE WORK OF THE CONTRACTOR SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
2. ALL CUTTING SHALL NOT WEAKEN THE STRUCTURAL INTEGRITY AND HOLES IN STRUCTURAL MEMBERS SHALL BE APPROVED BY THE STRUCTURAL ENGINEER.

SUPPORTS, ANCHORS, AND BASES

1. PROVIDE ANCHORING TO RESIST EARTHQUAKE FORCES AS REQUIRED BY CODE. UNLESS OTHERWISE NOTED, ALL DUCTWORK, PIPING, AND EQUIPMENT SHALL BE RESTRAINED TO RESIST SEISMIC FORCES AND LIMIT VIBRATION TRANSMISSION.
   A. PIPE 1" OR SMALLER IN THE MECHANICAL ROOM AND 2" OR SMALLER OUTSIDE THE MECHANICAL ROOM DOES NOT REQUIRE SEISMIC BRACING.
   B. DUCTWORK WITH A CROSS SECTIONAL AREA OF LESS THAN 6 SQUARE FEET DOES NOT REQUIRE SEISMIC BRACING.
2. PROVIDE ALL ANCHORS, HANGERS, ATTACHMENTS, BASES, AND SUPPORTS PER MANUFACTURER'S REQUIREMENTS FOR ALL PIPING, DUCTING, AND EQUIPMENT.
3. CHAIN, WIRE STRAP, OR OTHER MAKESHIFT DEVICES WILL NOT BE PERMITTED AS HANGERS OR SUPPORTS.
4. SPACING OF HANGERS AND SUPPORTS SHALL NOT BE INSTALLED OVER 12" FROM EACH CHANGE IN DIRECTION OF PIPING AND SPACING FOR STRAIGHT RUNS SHALL NOT EXCEED THE SPACING LISTED BELOW:

TYPE OF PIPE	SIZE	MAXIMUM SPACING
COPPER	UP TO 1"	5'-0"
COPPER	1-1/4" - 1-1/2"	7'-6"
COPPER	2" AND UP	10'-0"
PLASTIC	ALL	AS RECOMMENDED BY MANUFACTURER INCLUDING ANY REINFORCING
CAST IRON	ALL	1 PER LENGTH (ADJ TO JOINT)
HUBLESS CAST IRON	ALL	AS PER PLUMBING CODE

INSULATION

1. ALL PRODUCTS USED SHALL BE UL LISTED WITH A MAXIMUM FLAME SPREAD RATING OF 25 AND MAXIMUM SMOKE DEVELOPMENT OF 50.
2. REFER TO DUCT AND PIPE INSULATION SCHEDULES AND THE PROJECT DRAWINGS FOR REQUIRED INSULATION. DUCT AND PIPE INSULATION SCHEDULES SHALL TAKE PRECEDENCE OVER PROJECT DRAWINGS WHERE DISCREPANCIES OCCUR UNLESS A HIGHER INSULATION VALUE IS REQUIRED ON PLAN DRAWINGS.
3. ALL DUCTING AND PIPING SYSTEMS SHALL BE PROVIDED WITH EXTERIOR INSULATION ACCORDING TO IECC REQUIREMENTS AT A MINIMUM.
4. INTERIOR ACOUSTICAL LINING SHALL BE EQUAL TO OWENS CORNING QUIETR ROTARY DUCT LINER, 1/2" THICK, AND PROVIDED WHERE SHOWN OR NOTED ON DRAWINGS.
5. EXTERIOR DUCT INSULATION SHALL BE EQUAL TO OWENS CORNING TYPE 7 FIBERGLASS DUCT WRAP 1" OR 2" THICK WITH FOIL REINFORCED KRAFT JACKET.
6. EXTERIOR PIPE INSULATION FOR EXPOSED PIPES SHALL BE EQUAL TO OWENS CORNING SSL II WITH ASJ MAX.
7. EXTERIOR PIPE INSULATION FOR CONCEALED PIPES SHALL BE EQUAL TO ARMACELL AP ARMAFLEX TUBES.
8. ALL INSULATION WILL HAVE DIRECT CONTACT WITH PIPE, DUCTING, VALVES OR OTHER ACCESSORY AND HANGERS SHALL BE ON EXTERIOR OF INSULATION WITH APPROPRIATE INSULATION SHIELDS.

DUCTWORK AND ACCESSORIES

1. CONTRACTOR SHALL PROVIDE ALL DUCT SYSTEMS AS INDICATED ON THE PLANS INCLUDING ALL GRILLES, REGISTERS, DIFFUSERS, LOUVERS, DAMPERS, DUCTWORK AND DUCTWORK ACCESSORIES AS SHOWN OR DESCRIBED.
2. DUCT CONSTRUCTION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS AND TO THE VARIOUS APPLICABLE MANUALS AND STANDARDS OF THE SHEET METAL AND AIR CONDITION NATIONAL ASSOCIATION (SMACNA) AND/OR MATERIAL AND DUCT CONSTRUCTION STANDARDS OF THE AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS (ASHRAE).
3. DUCT AND FITTINGS TO BE OF G90 GALVANIZED STEEL UNLESS OTHERWISE INDICATED. MATERIAL GAUGES TO BE IN ACCORDANCE WITH THE SMACNA AND ASHRAE STANDARDS.
   A. PROVIDE WITH NECESSARY OFFSETS AND TRANSITIONS TO AVOID INTERFERENCE WITH THE BUILDING CONSTRUCTION, PIPING OR EQUIPMENT. LOCATE DUCTS WITH SUFFICIENT SPACE AROUND EQUIPMENT TO ALLOW OPERATION AND MAINTENANCE.
   B. JOINTS AND SEAMS SHALL BE MECHANICALLY SECURE AND SEALED AIRTIGHT.
   C. LONGITUDINAL SEAMS SHALL BE POINTED DOWN AND SEALED AIRTIGHT.
4. DUCT DIMENSIONS INDICATED ON DRAWINGS ARE INSIDE SHEET DIMENSIONS. THE DUCT DIMENSIONS SHALL BE INCREASED AN EQUIVALENT AMOUNT TO ACCOMMODATE THE INTERNAL LINER WHERE REQUIRED.
5. PROVIDE INSULATED INTAKE AND EXHAUST PLENUMS ATTACHED TO LOUVERS.
6. BUILDING FRAMING CAVITIES SHALL NOT BE USED AS DUCTS OR PLENUMS.
7. FLEXIBLE DUCT SHALL BE PROVIDED AS INDICATED OR NOTED ON PLAN. FLEXIBLE DUCT SHALL NOT BE INTERCHANGEABLE WITH SOLID DUCT UNLESS NOTED ON PLAN.
   A. INSULATED FLEXIBLE DUCT SHALL BE EQUAL TO THERMAFLEX TYPE M-KE R-8.
   B. NON-INSULATED FLEXIBLE DUCT SHALL BE EQUAL TO THERMAFLEX TYPE S-LP-10.
8. ACCESS DOORS IN DUCTWORK SHALL BE PROVIDED TO ACCESS LINKAGE SIDE OF DAMPERS, FILTERS, SENSORS OR DEVICES REQUIRING ACCESS.
9. HIGH EFFICIENCY TAKEOFFS SHALL BE PROVIDED.
10. BALANCING DAMPERS SHALL BE INCLUDED ON ALL BRANCH TAKEOFFS IN ACCESSIBLE ATTICS, CRAWLSPACES, OR MECHANICAL ROOMS. BALANCING DAMPERS SHALL BE EQUAL TO GREENHECK MBD-10 FOR RECTANGLE DUCT AND MBDR-50 FOR ROUND.
11. GRILLES, REGISTERS, AND DIFFUSERS SHALL BE FURNISHED AND INSTALLED WITH ALL NECESSARY ACCESSORIES SUCH AS GASKETS, FRAMES, SCREWS, AND/OR KEY OPERATORS.
   A. ALL SIZES, TYPES, AND FINISHES SHALL BE AS NOTED IN SCHEDULES AND SUBMITTED TO THE GENERAL CONTRACTOR, INTERIOR DESIGNER, ARCHITECT AND ENGINEER PRIOR TO ORDERING.
12. LOUVERS TO BE PROVIDED AS NOTED IN THE SCHEDULES OR ELSEWHERE ON DRAWINGS. SUBSTITUTE LOUVERS SHALL HAVE EQUAL FREE AREA OR MORE THAN SPECIFIED UNITS.
   A. ALL SIZES, TYPES, AND FINISHES SHALL BE AS NOTED IN SCHEDULES AND SUBMITTED TO THE GENERAL CONTRACTOR, ARCHITECT AND ENGINEER PRIOR TO ORDERING.
   B. LOUVERS MOUNTING IN MASONRY WALL SHALL BE FURNISHED WITH AN EXTENDED OR SEPARATE SILL AND BE BOX FRAME WITHOUT FACE FLANGE.
13. MOTORIZED DAMPERS SHALL BE EQUAL TO RUSKIN CD-50 OR CD-40 LOW LEAKAGE DAMPER WITH AIRFOIL BLADES AND VINYL DOUBLE SEALS.

HYDRONIC PIPING SYSTEM AND ACCESSORIES

1. HYDRONIC SERVICE WATER PIPING SHALL BE NEW AND CLEAN. PIPE MATERIAL SHALL BE PROVIDED AS SCHEDULED ON DRAWINGS UNLESS OTHERWISE NOTED.
2. HYDRONIC PIPE IS TO BE COPPER, STEEL, OR AQUATHERM FOR ALL PIPE 1-1/4" IN DIAMETER UP TO 4" AND LARGER UNLESS OTHERWISE NOTED.
3. PROVIDE WITH ALL ACCESSORIES AND EQUIPMENT FOR A FULLY COMPLETE AND OPERATIONAL SYSTEM INCLUDING BUT NOT LIMITED TO VALVES, STRAINERS, FLEXIBLE PIPE CONNECTIONS, SENSOR WELLS, VALVES, CIRCUIT SETTERS, AIR SEPARATORS, EXPANSION TANKS, GLYCOL FEED TANKS, TEMPERATURE AND/OR PRESSURE GAUGES.
4. PIPING SHALL BE SLOPED UPWARDS IN THE DIRECTION OF WATER FLOW WHERE POSSIBLE. NO SAGS SHALL BE ALLOWED IN THE PIPING SYSTEM.
5. PUMPS SHALL BE PROVIDED WITH ISOLATION VALVES AND MEANS OF PROVIDING SYSTEM BALANCE.
6. AIR VENTS SHALL BE INSTALLED AS NOTED AND AIR VENTS SHALL BE INSTALLED AT ALL HIGH POINTS IN PIPING SYSTEM AND ON ALL MANIFOLDS AND EQUIPMENT. AIR VENTS TO BE CALEFFI 5021 OR SIMILAR.
7. BURIED PIPING OUTSIDE THE BUILDING ENVELOPE SHALL BE UPONOR ECOFLEX WITH OXYGEN BARRIER UNLESS OTHERWISE NOTED. LENGTHS TO BE CONTINUOUS WITH NO BURIED UNIONS.
8. BURIED PIPING INSIDE THE BUILDING ENVELOPE SHALL BE AQUATHERM FOR ALL PIPE 1-1/4" IN DIAMETER AND LARGER. BURIED PIPING INSIDE THE BUILDING THERMAL 1" AND SMALLER TO BE PEX CONFORMING TO ASTM F876 AND ASTM F877 WITH OXYGEN BARRIER MARKED WITH ASTM F2080 AND/OR DIN 4726. NO PEX FITTINGS ARE TO BE BURIED BELOW GRADE.
9. BURIED PIPING IS TO BE PRESSURE TESTED FOR 48 HOURS TO 40PSI MINIMUM WITH NO DROP IN PRESSURE PRIOR TO FILL.
10. CONTRACTOR OPTION: PIPING RUNOUT TO HYDRONIC MANIFOLDS MAY BE PEX CONFORMING TO ASTM F876 AND ASTM F877 WITH OXYGEN BARRIER MARKED WITH ASTM F2080 AND/OR DIN 4726 AND EQUIPPED WITH FITTINGS CERTIFIED TO ASTM F2080 FOR PIPE 1" IN DIAMETER AND SMALLER.
11. ALL PIPE SHALL BE INSULATED PER INSULATION SCHEDULES, SPECIFICATIONS, OR LOCAL CODE WHICHEVER IS GREATER.
12. WHERE RADIANT TUBING EXISTS IN FLOOR, A SLEEVE SHALL BE PLACED AROUND THE TUBE WITH THE SLEEVE EXTENDING A MINIMUM OF 10" ON EACH SIDE OF THE TRANSITION.

DOMESTIC WATER PIPING

1. PIPING SERVING DOMESTIC WATER THAT IS BELOW GRADE SHALL BE PEX LISTED TO NSF 61. NO FITTING ARE PERMITTED BELOW GRADE.
2. PIPING SERVING DOMESTIC WATER THAT IS ABOVE EXPOSED ABOVE GRADE, OR IN CABINETRY ABOVE GRADE SHALL BE TYPE L COPPER. FITTINGS TO BE SWEAT, WROUGHT COPPER FITTINGS.
3. PIPING SERVING DOMESTIC WATER THAT IS CONCEALED ABOVE GRADE SHALL BE TYPE L COPPER. FITTINGS TO BE SWEAT, WROUGHT COPPER FITTINGS.
   A. CONTRACTOR OPTION - PIPING SERVING DOMESTIC WATER THAT IS CONCEALED ABOVE GRADE TO BE PEX LISTED TO NSF 61. FITTINGS TO BE LISTED TO F1960 EXPANSION. LEAD FREE BRASS OR POLYMER LISTED TO NSF61. CONTRACTOR TO PROVIDE SHOP DRAWING FOR PIPING SIZED FOR PEX AND COST DELTA FROM COPPER.
4. MAKE ADEQUATE PROVISIONS FOR PIPE EXPANSION. ANCHOR BLOCK AND BRACE PIPE TO PREVENT MOVEMENT FROM WATER SURGES.
5. ROUTE ALL DOMESTIC WATER PIPING WITHIN THE BUILDING THERMAL ENEVLOPE. PIPING SHALL NOT BE ROUTED IN EXTERIOR WALLS OR VENTILATED ATTICS UNDER ANY CIRCUMSTANCES.
6. PROVIDE ANTI-SIPHON AND BACKFLOW PREVENTION DEVICES ON ANY EQUIPMENT EQUIPMENT CAPABLE OF BACKFLOW INTO THE DOMESTIC WATER SYSTEM.
7. VALVES SERVING DOMESTIC WATER 1/2" TO 2" NPS TO BE BALL VALVE, BRONZE, TWO PIECE, FULL PORT, WITH STAINLESS TRIM, LEAD FREE. 2" TO 4" NPS TO BE BUTTERFLY VALVE, DUCTILE IRON BODY, ALUMINUM BRONZE DISC, STAINLESS STEM, LOCKING LEVER ACTUATOR, LEAD FREE.

SANITARY WASTE, VENT AND STORM PIPING

1. NON-BURIED PIPING ABOVE FLOOR SLAB SERVING SANITARY WASTE SHALL BE SERVICE WASTE CAST IRON SOIL PIPE. HEAVY DUTY NO HUB COUPLERS.
2. BURIED PIPING BELOW FLOOR SLAB SERVING SANITARY WASTE SHALL BE BELL AND SPIGOT SERVICE WASTE CAST IRON SOIL PIPE WITH COMPRESSION GASKETS OR NO-HUB SERVICE WEIGHT CAST IRON WITH HEAVY-DUTY COUPLERS.
3. NON-BURIED PIPING ABOVE FLOOR SLAB SERVING STORM SHALL BE SERVICE WASTE CAST IRON SOIL PIPE. HEAVY DUTY NO HUB COUPLERS.
4. BURIED PIPING BELOW FLOOR SLAB SERVING STORM SHALL BE BELL AND SPIGOT SERVICE WASTE CAST IRON SOIL PIPE WITH COMPRESSION GASKETS OR NO-HUB SERVICE WEIGHT CAST IRON WITH HEAVY-DUTY COUPLERS.
5. SANITARY VENT PIPING TO BE SOLID WALL SCH 40 PVC. FITTINGS TO BE SOLVENT WELDED WITH TWO PART PRIMER AND GLUE.
6. CONTRACTOR OPTION - PIPING SERVING HORIZONTAL SANITARY WASTE AND STROM TO BE SOLID WALL SCH 40 PVC. FITTINGS TO BE SOCKET TYPE SOLVENT WELDED WITH TWO PART PRIMER AND GLUE. CONTRACTOR TO PROVIDE COST DELTA FROM CAST IRON.

FUEL GAS PIPING

1. PIPING SERVING FUEL GAS 1/2" TO 2" NPS TO BE SCH 40 STEEL WITH THREADED FITTING. PIPING 2-1/2" NPS AND LARGER TO BE SCH 40 WITH WELDED AND FLANGED FITTINGS.

CONDENSATE DRAIN

1. PIPING SERVING CONDENSATE DRAIN TO BE SCH 40 SOLID WALL PVC. FITTINGS TO BE SOCKET TYPE SOLVENT WELDED WITH TWO PART PRIMER AND GLUE. PIPING NOT LOCATED IN MECHANICAL SPACES TO BE PROVIDED WITH 1/2" ACCOUSTICAL PIPE WRAP INSULATION.

Professional Engineer
ADAM FRANKS
14811
Date
WYOMING
04/16/2025

#	Description	Date
	Revisions	

Drawing Title
MECHANICAL
SPECIFICATIONS

Date
2025.04.16

Mechanical:
Engineering Solutions
David Majid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

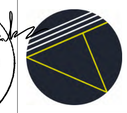
Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
75 LAKE SCHOOL ROAD
PUMP HOUSE

Architect:
Allied, LLC
mail PO Box 4055 Jackson, WY 83001
office 610 W Broadway Ave #103 Jackson, WY 83001
phone 307.249.8650



MANUAL - J/ASHRAE FUNDAMENTAL HEATING AND COOLING LOAD CALCULATIONS SUMMARY

PROJECT TITLE:	**TOJ HIGH SCHOOL RD WELL HOUSE**				
PROJECT LOCATION:	**JACKSON, WY**				
DESIGNER:	**T. MITCHELL**			DATE:	1/30/2025
DESIGN CONDITIONS:		SUMMER	95° F	WINTER	-30° F
AREAS		**COOLING**		**HEATING**	
ZONE	**FLOOR SQ.FT**	**SENSIBLE (BTU/Hr)**	**TOTAL (BTU/Hr)**	**(BTU/Hr)**	**BTU/Hr/SQ.FT**
101 - CONTROL_ROOM	414	90616	90616	15293	37
102 - DISINFECTION_ROOM	250.8	5083	5083	11697	47
103 - GENERATOR_ROOM	520.7	8659	8659	20902	40

MANUAL S COMPLIANCE REPORT

PROJECT NAME:	HIGH SCHOOL ROAD WELL HOSUE			**DATE: 08/14/2023**
MECHANICAL UNIT:	UH-1	UH-2	UH-3	FCU-1, FCU-2
EQUIMENT SELECTIONS				
MANUFACUTER	MARLEY	REZNOR	REZNOR	CARRIER
MODEL	QWD058832	EUH15	EUH7	40MAHQ24-A3
PERFORMANCE DATA AT DESIGN CONDITIONS				
HEATING CAPACITY (MBH)	17,060	38,557	18,767	13,603
SENSIBLE COOLING CAPACITY (MBH)	N/A	N/A	N/A	13,441
TOTAL COOLING CAPACITY (MBH)	N/A	N/A	N/A	15,349
DESIGN CONDITIONS				
ENTERING AIR TEMPERATURE COOLING	N/A	N/A	N/A	80°F
ENTERING AIR TEMPERATURE HEATING	70°F	70°F	70°F	72°F

Professional Engineer
ADAM HAMM
14811
Date
WYOMING
04/16/2025

Revisions

#	Description	Date

Drawing Title
MANUAL J, S

Date
2025.04.16

Mechanical:
Engineer
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

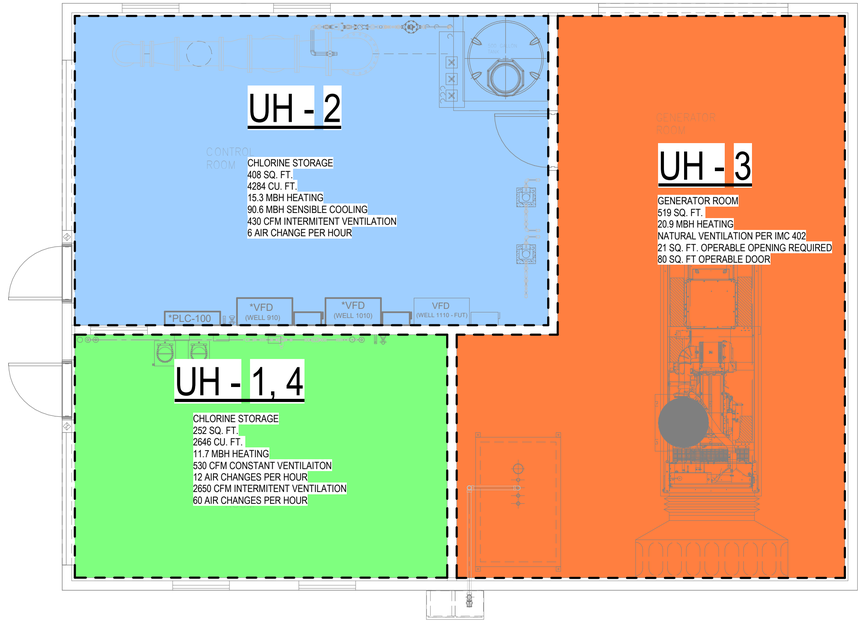
Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Allied 41 LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

M0.3

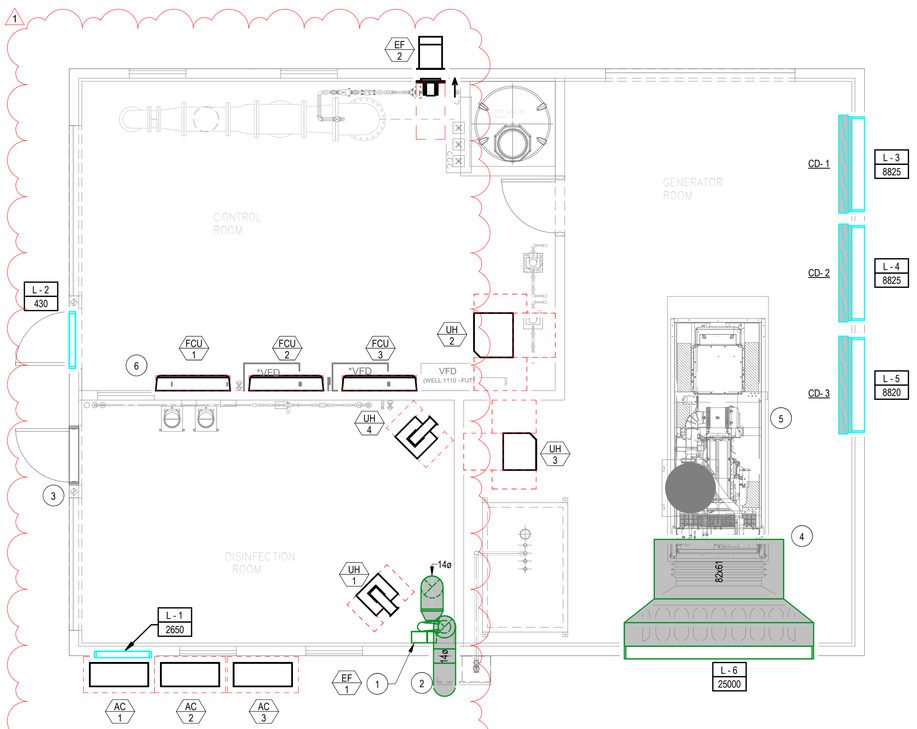


2 M1.0 MAIN LEVEL FORCED AIR ZONING PLAN

SCALE: 1/4" = 1'-0"

KEYED NOTES

1. PROVIDE INTAKE WITH ALUMINUM BIRD SCREEN. FAN TO BE MOUNTED ON WALL. INTAKE TERMINATION TO BE WITHIN 6" OF FLOOR. INTAKE DUCTING TO BE PVC.
2. EXHAUST TO BE TURNED DOWN ON EXTERIOR OF BUILDING. PROVIDE WITH ALUMINUM BIRDSCREEN. DUCTING TO BE PVC.
3. PROVIDE 30 MINUTE TIMER SWITCH FOR EF-1 AND WEATHERPROOF ENCLOSURE NEXT ON EXTERIOR WALL NEAR DOOR.
4. PROVIDE DUCTING AND FLEXIBLE DUCT CONNECTOR TO ATTACH TO RADIATOR.
5. PROVIDE GENERATOR WITH DOUBLE WALL INSULATED VENT PIPE, SELKIRK OR SIMILAR. PROVIDE WITH VENTILATED ROOF THIMBLE, INLINE DRAIN, FLIP TOP TERMINATION, EXPANSION JOINT AND PRESSURE RELIEF VALVE.
6. EF-1 CONTROLS TO BE LOCATED IN CONTROL ROOM, OUTSIDE OF CORROSIVE ENVIROMENT.



1 M1.0 MAIN LEVEL FORCED AIR PLAN

SCALE: 1/4" = 1'-0"

Revisions		
#	Description	Date
1	PERMIT REVISIONS	4/10/25

Drawing Title
MAIN LEVEL FORCED AIR PLAN

Date
2025.04.16

Mechanical:
Eastern Air
David Majid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carita Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TOWER SCHOOL ROAD
PUMP HOUSE

Architect:
ALL ARCH, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

Professional Engineer
ADAM HAWKINS
14811
Date
WYOMING

04/16/2025

M1.0

FORCED AIR HEATING & COOLING SEQUENCE OF OPERATIONS

1. GENERAL
THE FORCED AIR SYSTEM SHALL CONSIST OF ONE (1) AIR SOURCE HEAT PUMP, TWO (2) HIGH WALL FAN COIL UNITS, AND THREE (3) ELECTRIC UNIT HEATERS.

2. OPERATION
UPON A CALL FOR HEAT IN THE CONTROL, ROOM, FCU-1 AND FCU-2 WILL BE ENABLED. IF THE (FIELD ADJUSTABLE) OUTDOOR AIR TEMPERATURE HAS THE HEAT PUMP IN LOCKOUT, UNIT HEATER UH-2 SHALL BE ENABLED.

UPON A CALL FOR COOLING FROM THE THERMOSTAT, THE FAN COIL UNITS AND HEAT PUMP SHALL BE ENABLED.

UPON A CALL FOR HEAT IN THE GENERATOR ROOM OR CONTROL ROOM, THE RESPECTIVE ELECTRIC UNIT HEATER SHALL BE ENABLED.

WHEN THE ZONE IS SATISFIED THE OPERATION SHALL BE REVERSED.

1

CHLORINE ROOM VENTILATION CONTROL SEQUENCE

1. GENERAL
THE CHLORINE ROOM VENTILATION SYSTEM SHALL CONSIST OF ONE EXHAUST FAN, AND ASSOCIATED DUCTWORK AND DAMPERS.

2. OPERATION
DURING NORMAL OPERATION THE EF-1 SHALL CONTINUOUSLY RUN AT 730 RPM, PROVIDING 530 CFM OF VENTILATION. THE INTERMITTENT VENTILATION SHALL BE ENGAGED WHEN THE 30-MINUTE (FIELD ADJUSTABLE) TIMER SWITCH ON THE EXTERIOR OF THE BUILDING IS ACTIVATED, LOUVER L-1 SHALL MODULATE TO 100% OPEN AND EF-1 SHALL BE SET TO EXHAUST 2650 CFM. WHEN THE TIMER EXPIRES OR IS MANUALLY TURNED OFF, EF-1 SHALL RETURN TO NORMAL OPERATION AND L-1 SHALL RETURN TO IT'S MINIMUM POSITION.

GENERATOR ROOM LOUVER CONTROL SEQUENCE

1. GENERAL
THE GENERATOR ROOM VENTILATION SYSTEM SHALL CONSIST OF FOUR (4) LOUVERS, FOUR (4) CONTROL DAMPERS, AND ASSOCIATED DUCTWORK.

2. OPERATION
WHEN THE GENERATOR IS ENABLED, CONTROL DAMPERS CD-3, CD-4, AND CD-5 SHALL OPEN. IN THE EVENT OF POWER FAILURE, ALL CONTROL DAMPERS WILL FAIL TO THE OPEN POSITION. ONCE THE GENERATOR IS SHUT DOWN AND POWER HAS BEEN RESTORED, ALL CONTROL DAMPERS SHALL CLOSE.

WELL ROOM VENTILATION CONTROL SEQUENCE

1. GENERAL
THE VENTILATION SYSTEM SHALL CONSIST OF ONE EXHAUST FAN, EF-2, AND ASSOCIATED DUCTWORK AND DAMPERS.

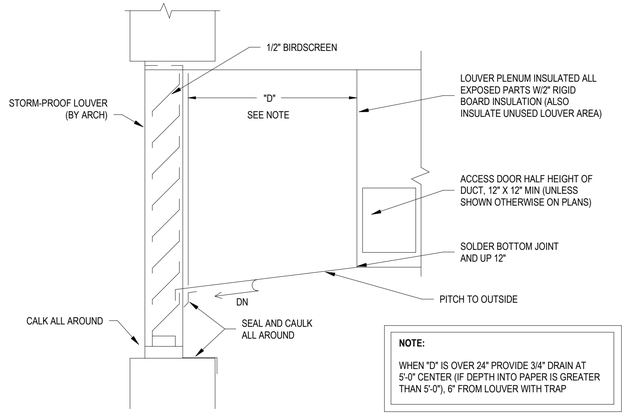
2. OPERATION
THE VENTILATION SYSTEM SHALL RUN CONTINUOUSLY UNDER NORMAL OPERATION AND PROVIDE 6 AIR CHANGES PER HOUR, 430 CFM, FOR THE SPACE. THE FAN SHALL LIMIT RELATIVE HUMIDITY IN THE ROOM TO LESS THAN 85%. TEMPERATURE IN THE ROOM SHALL BE CONTROLLED BY THE HEATING AND COOLING SYSTEMS.

1

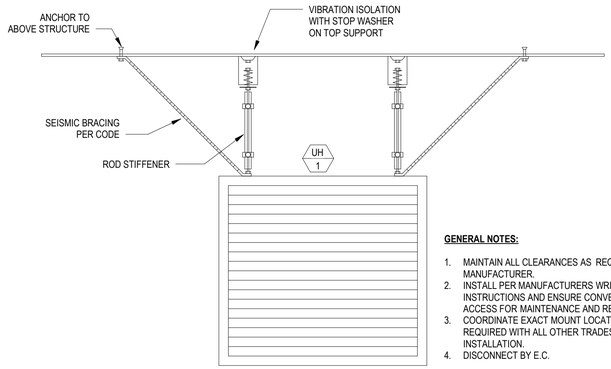
CHLORINE ROOM HEATING CONTROL SEQUENCE

1. GENERAL
THE CHLORINE ROOM VENTILATION SYSTEM SHALL CONSIST OF TWO UNIT HEATERS, UH-1 AND UH-2.

2. OPERATION
UH-1 SHALL ACT AS THE PRIMARY HEAT SOURCE FOR THE SPACE AND THE INTEGRAL THERMOSTAT SHALL BE SET TO 45°F OR HIGHER (FIELD ADJUSTABLE). THE INTEGRAL THERMOSTAT FOR UH-4 SHALL BE SET TO 40°F AND SHALL OPERATE DURING PERIODS OF INCREASED EXHAUST RATE.



1 M2.0 LOUVER CONNECTION DETAIL
SCALE: NTS



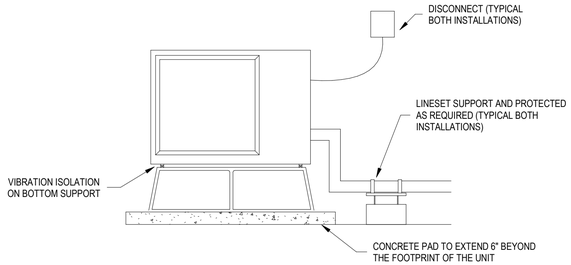
GENERAL NOTES:

1. MAINTAIN ALL CLEARANCES AS REQUIRED BY MANUFACTURER.
2. INSTALL PER MANUFACTURERS WRITTEN INSTRUCTIONS AND ENSURE CONVENIENT ACCESS FOR MAINTENANCE AND REPAIR.
3. COORDINATE EXACT MOUNT LOCATION AS REQUIRED WITH ALL OTHER TRADES PRIOR TO INSTALLATION.
4. DISCONNECT BY E.C.

4 M2.0 UNIT HEATER MOUNTING DETAIL
SCALE: NTS

GENERAL NOTES:

1. MAINTAIN ALL CLEARANCES AS REQUIRED BY MANUFACTURER.
2. ENSURE PROPER INSTALLATION IN HIGH WIND AREAS.
3. ENSURE LEVEL INSTALLATION OF UNIT AT LOCATION.
4. INSTALL PER MANUFACTURERS WRITTEN INSTRUCTIONS AND ENSURE CONVENIENT ACCESS FOR MAINTENANCE AND REPAIR.
5. REFRIGERANT LINES TO BE JACKETED FOR PROTECTION FROM SUNLIGHT, EXTREME TEMPS, AND SNOW.
6. ALL BUILDING PENETRATIONS TO BE PER IBC.
7. PROVIDE PROPER SUPPORT TO ALL REFRIGERATION LINES TO AND FROM THE UNIT, SEE SPECS.
8. DISCONNECT BY E.C.
9. COORDINATE EXACT MOUNT LOCATION AS REQUIRED WITH ALL OTHER TRADES PRIOR TO INSTALLATION.

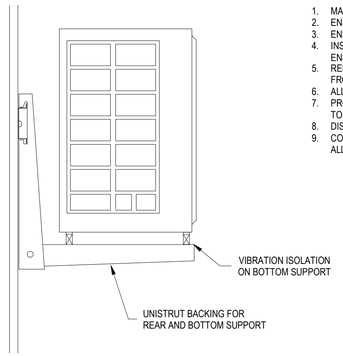


GROUND MOUNT

2 M2.0 OUTDOOR UNIT GROUND MOUNTING DETAIL
SCALE: NTS

GENERAL NOTES:

1. MAINTAIN ALL CLEARANCES AS REQUIRED BY MANUFACTURER.
2. ENSURE PROPER INSTALLATION IN HIGH WIND AREAS.
3. ENSURE LEVEL INSTALLATION OF UNIT AT LOCATION.
4. INSTALL PER MANUFACTURERS WRITTEN INSTRUCTIONS AND ENSURE CONVENIENT ACCESS FOR MAINTENANCE AND REPAIR.
5. REFRIGERANT LINES TO BE JACKETED FOR PROTECTION FROM SUNLIGHT, EXTREME TEMPS, AND SNOW.
6. ALL BUILDING PENETRATIONS TO BE PER IBC.
7. PROVIDE PROPER SUPPORT TO ALL REFRIGERATION LINES TO AND FROM THE UNIT, SEE SPECS.
8. DISCONNECT BY E.C.
9. COORDINATE EXACT MOUNT LOCATION AS REQUIRED WITH ALL OTHER TRADES PRIOR TO INSTALLATION.



WALL MOUNT

3 M2.0 OUTDOOR UNIT WALL MOUNTING DETAIL
SCALE: NTS

#	Description	Date
1	PERMIT REVISIONS	4/10/25

Drawing Title
MECHANICAL DETAILS AND CONTROL SEQUENCES

Date
2025.04.16

Mechanical:
Eastern IT
David Majid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TOWER SCHOOL ROAD
PUMP HOUSE

Architect:
ALLIED 47, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

Professional Engineer
ADAM HAWKINS
14811
Date
WYOMING
04/16/2025

M2.0

DAMPER SCHEDULE

MARK	MANUFACTURER	MODEL	SIZE (IN)	AIR FLOW (CFM)	REMARKS
CD-1	GREENHECK	ICD-45	90x60	8,825	1, 2, 3, 4
CD-2	GREENHECK	ICD-45	90x60	8,825	1, 2, 3, 4
CD-3	GREENHECK	ICD-45	90x60	8,820	1, 2, 3, 4

REMARKS:
1. APPROVED ALTERNATIVE MANUFACTURERS: SUBMIT TO ENERGY 1 FOR APPROVAL.
2. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
3. PROVIDE WITH 120V FAIL OPEN ACTUATOR AND EXTERNAL ACTUATOR MOUNTING.
4. DAMPER TO BE INTERLOCKED WITH GENERATOR OPERATION.

CONDENSER UNIT SCHEDULE

MARK	MANUFACTURER	MODEL	INDOOR UNIT	NOMINAL TONS	CONDENSOR FAN		COOLING CAPACITY (67°EWB, 95° OAT)		ELECTRICAL DATA			REMARKS
					AIR FLOW (CFM)	FAN POWER (W)	SENSIBLE (BTU/HR)	TOTAL (BTU/HR)	MCA (A)	MOCP (A)	VOLTS/Φ	
AC-1	DAIKIN	RKS36LVJU	FCU-1	3	2,627	200 W	22,890 Btu/h	36,000 Btu/h	19.5 A	20.0 A	208/1	1, 2, 3, 4, 5
AC-2	DAIKIN	RKS36LVJU	FCU-1	3	2,627	200 W	22,890 Btu/h	36,000 Btu/h	19.5 A	20.0 A	208/1	1, 2, 3, 4, 5
AC-3	DAIKIN	RKS36LVJU	FCU-1	3	2,627	200 W	22,890 Btu/h	36,000 Btu/h	19.5 A	20.0 A	208/1	1, 2, 3, 4, 5

REMARKS:
1. APPROVED ALTERNATIVE MANUFACTURERS: SUBMIT TO ENERGY 1 FOR APPROVAL.
2. PROVIDE WITH STAND, WIRE REMOTE CONTROLLER, AND ULTRA-LOW AMBIENT COOLING KIT INCLUDING CONTROL BOARD, CRANKCASE HEATER, AND WIND BAFFLE FOR OPERATION DOWN TO -40°F OUDOOR AIR TEMPERATURE.
3. ADJUST FOR ALTITUDE, CAPACITIES ARE BASED ON MANUFACTURER'S DATA.
4. MAINTAIN CLEARANCE ZONES SHOWN. SEE MANUFACTURER'S DOCUMENTATION FOR EXACT MEASUREMENTS.
5. ELECTRICIAN TO PROVIDE ELECTRIC DISCONNECT.

FAN COIL UNIT SCHEDULE

MARK	MANUFACTURER	MODEL	OUTDOOR UNIT	NOMINAL TONS	AIR FLOW (CFM)	COOLING (80°F EWB, 95° OAT)		VOLTS/Φ	REMARKS
						SENSIBLE (BTU/HR)	TOTAL (BTU/HR)		
FCU-1	DAIKIN	FTXS36LVJU	AC-1	3	770	22,890	36,000	230/1	1, 2, 3, 4
FCU-2	DAIKIN	FTXS36LVJU	AC-2	3	770	22,890	36,000	230/1	1, 2, 3, 4
FCU-3	DAIKIN	FTXS36LVJU	AC-3	3	770	22,890	36,000	230/1	1, 2, 3, 4

REMAKRS:
1. APPROVED ALTERNATIVE MANUFACTURERS: SUBMIT TO ENERGY 1 FOR APPROVAL.
2. PROVIDE WITH BRC944B2-A08 WIRE REMOTE CONTROLLER
3. ROUTE CONDENSATE DRAIN TO SANITARY SEWER LINE. USE TRAP AND AIR GAP WHEN CONNECTED DIRECTLY TO SANITARY SEWER. PROVIDE CONDENSATE PUMP IF CONDENSATE DRAIN CANNOT BE GRAVITY FED TO FLOOR DRAIN OR SANITARY LINE.
4. UNIT POWERED BY OUTDOOR UNIT.

FAN SCHEDULE

MARK	MANUFACTURER	MODEL	TYPE	AIR FLOW (CFM)	ESP (IN. WC.)	RPM	DRIVE	SONES	ELECTRICAL DATA			REMARKS
									POWER (W)	AMPS (A)	VOLTS/Φ	
EF-1	PLASTEC	P30ST4P150	CHEMICAL RESISTANT EXHAUST FAN	2,650	1.95	1725	DIRECT	24	1,600	4.4	208/3	1, 2, 3, 4
EF-2	GREENHECK	SE1-12-432-VG	WALL EXHUAST FAN	430	0.25	1171	DIRECT	5.7	437	2.1	208/1	1, 2, 5

REMARKS:
1. APPROVED ALTERNATIVE MANUFACTURER'S: SUBMIT TO ENERGY 1 FOR APPROVAL.
2. INSTALL PER MANUFACTURER'S INSTRUCTIONS.
3. PROVIDE WITH STAINLESS STEEL STAND, INLET AND OUTLET BIRD SCREENS,, VFD, AND OPERATION SIGNAL LIGHT ON EXTERIOR OF CHLORINE ROOM.
4. FAN TO BE CONTROLLED BY TIMER SWITCH ON EXTERIOR OF SPACE. TIMER TO BE PROTECTED BY TAMPER RESISTANT ENCLOSURE.
5. FAN TO RUN CONTINUOUSLY TO PROVIDE MECHANICAL VENTILATION FOR SPACE.

ELECTRIC UNIT HEATER SCHEDULE

MARK	MANUFACTURER	MODEL	HEATING CAPACITY (BTU/HR)	ELECTRICAL DATA			REMARKS
				POWER (KW)	AMPS (A)	VOLTS/Φ	
UH-1	MARLEY	QWD39432	133,068	39	47.7	480/3	1, 2, 3
UH-2	REZNOR	EUH15	38,557	11	31.5	208/3	1, 2, 3
UH-3	REZNOR	EUH7	18,767	6	15.5	208/3	1, 2, 3
UH-4	MARLEY	QWD20432	68,240	20	24.8	480/3	1, 2, 3

REMARKS:
1. APPROVED ALTERNATIVE MANUFACTURERS: SUBMIT TO ENERGY 1 FOR APPROVAL.
2. ELECTRICIAN TO PROVIDE ELECTRIC DISCONNECT.
3. TO BE CONTROLLED BY REMOTE THERMOSTAT.

LOUVER SCHEDULE

MARK	MANUFACTURER	MODEL	SERVICE	SIZE (IN)	FREE AREA (SQFT)	AIR FLOW (CFM)	ESP (IN WC)	REMARKS
L-1	GREENHECK	EAD-401	DISINFECTION INTAKE	36"x36"	2.9 SF	2,650	0.11 in-wg	1, 2, 4
L-2	GREENHECK	EAD-401	CONTROL ROOM INTAKE	12"x36"	0.6 SF	430	0.08 in-wg	1, 2, 3
L-3	GREENHECK	AFA-801	GENERATOR ROOM INTAKE	90"x60"	13.6 SF	8,825	0.03 in-wg	1, 2, 3
L-4	GREENHECK	AFA-801	GENERATOR ROOM INTAKE	90"x60"	13.6 SF	8,825	0.03 in-wg	1, 2, 3
L-5	GREENHECK	AFA-801	GENERATOR ROOM INTAKE	90"x60"	13.6 SF	8,820	0.03 in-wg	1, 2, 3
L-6	GREENHECK	AFA-801	GENERATOR RADIATOR EXHAUST	90"x120"	27.2 SF	25,000	0.06 in-wg	1, 2, 3

REMARKS:
1. APPROVED ALTERNATIVE MANUFACTURER'S: TO BE OF EQUAL QUALITY AND PERFORMANCE.
2. CONFIRM COLOR AND FINISH WITH ARCHITECT PRIOR TO ORDERING.
3. PROVIDE WITH INSECT SCREEN, 2-POSITION-SPRING-RETURN ACTUATOR AND BAKED ENAMEL PAINT. COLOR TO BE SELECTED BY ARCHITECT
4. PROVIDE WITH INSECT SCREEN, FAIL OPEN 2-POSITION-SPRING-RETURN ACTUATOR WITH NEMA 4 ENSLOCURE, AND KYNAR ENAMEL PAINT. COLOR TO BE SELECTED BY ARCHITECT.

Revisions

#	Description	Date
1	PERMIT REVISIONS	4/10/25

Drawing Title
MECHANICAL SCHEDULES

Date
2025.04.16

Mechanical:
Energy 1
David Majid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TJ MEH SCHOOL ROAD
PUMP HOUSE

Architect:
Allied 4 LLC
mail PO Box 4055 Jackson, WY 83001
office 610 W Broadway Ave #103 Jackson, WY 83001
phone 307.249.8650

Professional Engineer
ADAM HAWKES
14811
Date
WYOMING

04/16/2025

1 / FX001 FIRE SPRINKLER REFERENCE SITE PLAN
NO SCALE

SHEET INDEX

FX001	SITE PLAN, RISER, DETAILS AND LEGEND, FIRE SPRINKLER FLOOR PLAN

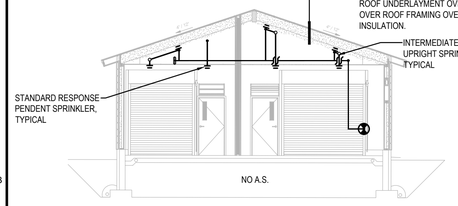
FLOW TEST
98 PSI STATIC
95 PSI RESIDUAL W/
2000 GPM FLOWING

Hydraulically Calculated System

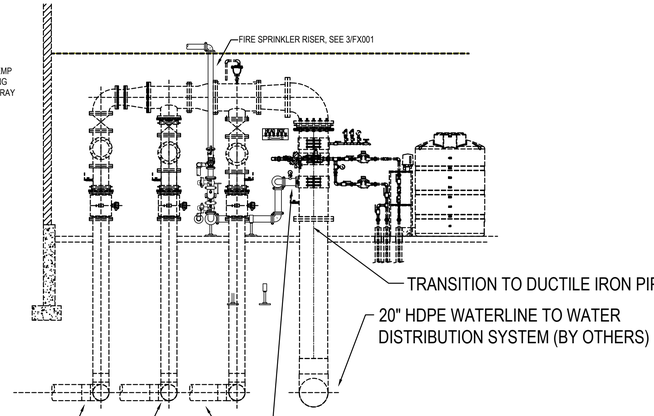
This system as shown on COFFMAN ENGINEERS
company print no. FX001 dated 2/6/2025
for ENTIRE BUILDING
at WELL HOUSE contract no 250174
is designed to discharge at a rate of 0.3 gpm
(l/min) per sq ft (m2) of floor area over a max area of
ENTIRE BUILDING sq ft (m2) when supplied
with water at the rate of 582.91+500 gpm (l/min)
at 48.00 psi (bars) at the base of the riser
Hose stream allowance of 500 gpm (l/min)
is included in the above.
Occupancy classification EXTRA HAZARD I
Commodity classification N/A
Maximum storage height N/A
Installed by CONTRACTOR

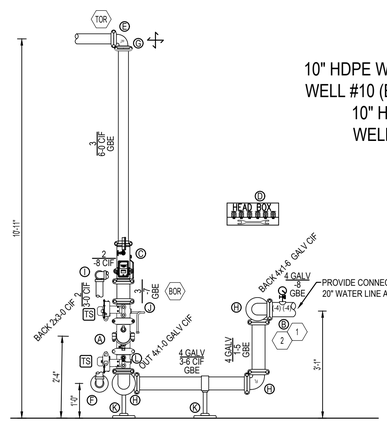
General Information Sign

1. Name & Location of Facility: HIGH SCHOOL ROAD WELL HOUSE JACKSON, WY	9. Flow Test Data: 98 PSI STATIC, 95 PSI RES @ 2000 GPM
2. Occupancy Classification: EXTRA HAZARD GROUP I	10. Presence of Flammable/Combustible Liquids: NO
3. Commodity Classification: N/A	11. Presence of Hazardous Materials: YES
4. Presence of High-piles and/or Rack Storage: NO	12. Presence of Other Special Storage: NO
5. Maximum Height of Storage Planned: N/A	13. Location of Aux. Drains & Low Point Drains on Dry and Preaction Systems: N/A
6. Aisle Width Planned: N/A	14. Original Results of Main Drain Flow Test: TBD
7. Encapsulation of Pallet Loads: NO	15. Name of Installing Contractor or Designer: TBD
8. Presence of Solid Shelving: NO	16. Indications of Presence and Location of Antifreeze or Other Auxiliary Systems: N/A



2 / FX001 FIRE SPRINKLER REFERENCE BUILDING SECTION
1/8" = 1'-0"





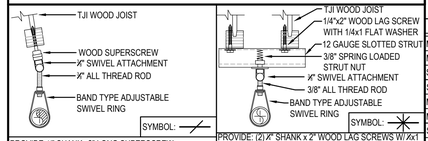
3 / FX001 FIRE SPRINKLER RISER DETAIL
1/4" = 1'-0"

4 / FX001 FIRE SPRINKLER RISER COORDINATION DETAIL
1/4" = 1'-0"

RISER LEGEND ⊗

A. 4" REDUCED PRESSURE ZONE ASSEMBLY WITH GROOVED BUTTERFLY VALVES AND BUILT-IN TAMPER SWITCHES - AMES, MODEL "COLT" C4002BFG - WITH 2" AIR GAP DRIP CUP WITH SLASH GUARD - AMES, MODEL 7018546
   - PROVIDE (2) "CONTROL VALVE" SIGNS WITH CHAIN FOR THE BUTTERFLY VALVES
   - ROUTE AIR GAP DRAIN TO FLOOR DRAIN
B. 1/4X GALV HEX BUSHING, 1/4x-3 GALV NIPPLE, 1/4" 3-WAY VALVE, 1/4" WATER GAUGE, 1/4" PLUG - "GAUGE KIT"
C. 3" RISER MANIFOLD WITH FLOW SWITCH, TEST AND DRAIN VALVE, PRESSURE GAUGE AND PRESSURE RELIEF VALVE
   - RELIABLE MODEL CR WITH MAIN DRAIN AND TEST ORIFICE.
   - NO ADDITIONAL SIGNAGE TO BE PROVIDED - "INSPECTORS TEST" AND "MAIN DRAIN" WORDING CAST IN BODY
D. SPARE HEAD CABINET WITH MINIMUM AS REQUIRED PER NFPA #13 - (6) HEAD MODEL WITH WRENCHES.
E. 3" GROOVED ELL - SHORT TAKEOUT.
F. TERMINATE MAIN DRAIN THROUGH WALL WITH A 2" GMI 45° ELL AND 2GALVx-2 TOE. SECURE TO EACH SIDE OF WALL WITH (2) 2" SOLID GALV WALL PLATES.
G. 3" GROOVED FLEXIBLE COUPLING.
H. 4" GROOVED ELL - SHORT TAKEOUT.
I. 2" THREADED GMI ELL.
J. 4x3 REDUCING COUPLING.
K. 2" DIAMETER PIPESTAND WITH THREADED COMPANION FLANGE BOLTED TO FLOOR W/ (4) 1/4" DRILL ANCHORS, 1/4x-1 HEX.
L. 4" GROOVED FLEXIBLE COUPLING.

TYPICAL HANGER AND RESTRAINT DETAILS



PROVIDE: 1/4" SHANK x2" LONG SUPERSCREW - ITW-BUILDEX MODEL GST-20, MIN. 2" EMBEDMENT INTO BASE MATERIAL, 1/4" SWIVEL ATTACHMENT 1/4xCIF (4" AVERAGE LENGTH FOR LISTING) ATR & PIPE RING.

PROVIDE: (2) 1/4" SHANK x 2" WOOD LAG SCREWS W/ 4x1 FLAT WASHERS; 12-GAUGE SLOTTED STRUT (SEE HANGER NOTES FOR SIZE), 1/4" SPRING-LOADED STRUT NUT, 1/4" HEX NUT & WASHER, 3/4CIF (6" AVERAGE LENGTH FOR LISTING) ATR & PIPE RING.

GENERAL HANGER NOTES

12-GAUGE SLOTTED STRUT FOR 3" PIPE: 1-5/8"x1-5/8"x18" LONG ANVIL-STRUT AS-200 (OR EQUIVALENT), SECTION MODULUS OF 0.202 IN³, MAXIMUM 3" PIPE WITH 1.5-FOOT TRAPEZE SPAN PER NFPA 13-2016 TABLE 9.1.1.7.1(A).

*ALL-THREAD-ROD SHALL BE CADMIUM-ZINC PLATED OR EQUAL.
*SEND ATR IN FULL 10' LENGTHS (I.E. NOT CUT AT FABRICATOR).
*SEND STRUT IN FULL 20' LENGTHS (I.E. NOT CUT AT FABRICATOR).
*ALL BRANCH LINE HANGER THREAD ROD LENGTHS ARE LESS THAN 6" FROM POINT OF ATTACHMENT TO STRUCTURE TO TOP OF PIPE, NO BRANCHLINE RESTRAINT REQUIRED U.O.N.

GENERAL NOTES

1. ALL CEILING HEIGHTS AT 10'-6" U.O.N.
2. ALL GROOVED COUPLINGS SHALL BE ZERO FLEX/RIGID U.O.N AND/OR REQUIRED BY CODE.
3. FIRE-STOPPING PENETRATIONS OF FIRE-RATED WALLS IS PROVIDED BY OTHERS.
4. PROVIDE SPLIT CHROME WALL PLATES AT ALL EXPOSED WALL PENETRATIONS IN FINISHED ROOMS.
5. ALL ROOMS ARE CLASSIFIED AS EXTRA HAZARD GROUP I OCCUPANCY (0.30 GPM/SQ FT OVER REMOTE AREA - 500 GPM HOSE) PER NFPA 13.
6. SINGLE-STORY BUILDING NOT EXCEEDING 2000 SQ. FT. IN AREA DOES NOT REQUIRE FDC PER NFPA 13-2019 PARAGRAPH 16.12.2
7. ALL PIPE IS CONCEALED ABOVE CEILING.

PLAN KEY NOTES ⊗

1. COIL-UP DOORS, NO A.S.
2. AIR VENT - PROVIDE: 1/4x-6 RN TO A 1/2" ELL & 1/4"x-6 TO 1/4" BALL VALVE WITH PLUG LOCATED NEAR THE HIGH POINT OF THE WET PIPE SYSTEM TO PROVIDE MANUAL AIR VENTING.

SEISMIC BRACING REQUIREMENTS

EARTHQUAKE BRACING SHALL CONFORM WITH N.F.P.A. #13, INTERNATIONAL BUILDING CODE, NEHRP, AND ASCE/SEI 7 CRITERIA.

DESCRIPTION OF SITE CONDITIONS	
MAPPED SPECTRAL ACCELERATION FOR SHORT PERIODS	S_S = 1.053
MAPPED SPECTRAL ACCELERATION FOR A 1-SECOND PERIOD	S_1 = 0.346
SITE CLASS	D
SEISMIC OCCUPANCY CATEGORY OF BUILDING	I
MAXIMUM SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS	S_{DS} = 0.842
MAXIMUM SPECTRAL RESPONSE ACCELERATION AT 1-SECOND PERIODS	S_{D1} = N/A
SEISMIC DESIGN CATEGORY BASED ON S_{DS}	D
SEISMIC DESIGN CATEGORY BASED ON S_{D1}	N/A
SEE CALCULATIONS BELOW FOR DETERMINATION OF FORCE FACTOR FOR SEISMIC DESIGN CATEGORY 'C' & 'D'.	
COMPONENT IMPORTANCE FACTOR	I_P = 1.50
COMPONENT RESPONSE MODIFICATION FACTOR	R_P = 4.50
COMPONENT AMPLIFICATION FACTOR	A_P = 2.50
HEIGHT IN STRUCTURE OF POINT OF ATTACHMENT W/ RESPECT TO THE BASE	Z = 11'-10"
AVERAGE ROOF HEIGHT OF STRUCTURE WITH RESPECT TO THE BASE	H = 13'-0"

$$F_P = \frac{0.4 * A_P * S_{DS} * W_P}{\frac{R_P}{I_P}} * (1 + 2 * \frac{Z}{H})$$

F_P = SEISMIC DESIGN FORCE, C_P FORCE FACTOR
W_P = 1.15 TIMES WEIGHT OF WATER FILLED PIPE
$F_P = C_P * W_P$ $F_P = 0.842 * W_P$
ASCE 7 ALLOWS A REDUCTION FACTOR OF 1.4 FOR STRESS BASED DESIGN: $F_P = 0.601 * W_P$

BRANCHLINE RESTRAINT REQUIREMENTS

SEISMIC COEFFICIENT, C_P = 0.601
SEE SEISMIC CALCULATIONS FOR C_P VALUES

STEEL BRANCH LINE SIZE	1"	1¼"	1½"	2"
MAXIMUM SPACING OF BRANCH LINE RESTRAINTS	36'	39'	41'	45'

WHERE NOT REQUIRED:
-NO RESTRAINT REQUIRED IF HANGER ROD IS LESS THAN 6" LONG MEASURED BETWEEN THE TOP OF THE PIPE AND THE POINT OF ATTACHMENT TO THE BUILDING STRUCTURE.
WHERE REQUIRED:
-ON ALL BRANCH LINES (WITH HANGER ROD >6") AT INTERVALS NOT EXCEEDING THOSE SPECIFIED IN TABLE ABOVE BASED ON BRANCH LINE DIAMETER AND THE VALUE OF C_P.
-SPRIG-UPS 4'-0" OR LONGER SHALL BE RESTRAINED AGAINST LATERAL MOVEMENT.

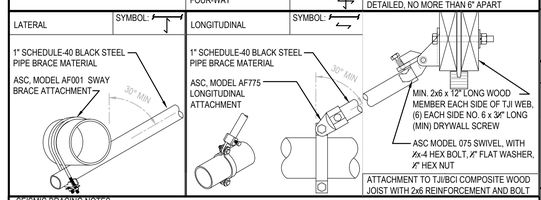
-RESTRAINT SHALL BE PROVIDED BY USE OF ONE OF THE FOLLOWING:
1) A LISTED SWAY BRACE ASSEMBLY
2) A WRAPAROUND U-HOOK
3) #12, 440-LB WIRE INSTALLED AT LEAST 45° FROM THE VERTICAL PLANE AND ANCHORED ON BOTH SIDES OF THE PIPE.
4) A HANGER NOT LESS THAN 45° FROM VERTICAL INSTALLED WITHIN 6" OF THE VERTICAL HANGER ARRANGED FOR RESTRAINT AGAINST UPWARD MOVEMENT, PROVIDED IT IS UTILIZED SUCH THAT L/R DOES NOT EXCEED 300, WHERE THE ROD SHALL EXTEND TO THE PIPE OR HAVE A SURGE CLIP RESTRAINT.
5) OTHER APPROVED MEANS

-WIRES USED FOR PIPING RESTRAINTS SHOULD BE ATTACHED TO THE BRANCH LINE WITH TWO TIGHT TURNS AROUND THE PIPE AND FASTENED WITH FOUR TIGHT TURNS WITHIN 1-1/2"(SEE DETAIL), AND ATTACHED TO THE STRUCTURE WITH MEANS APPROVED BY NFPA.

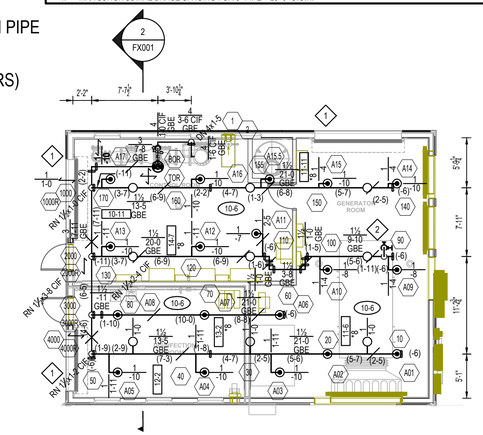
-RESTRAINT SHALL BE LOCATED WITHIN 2 FT OF A HANGER. THE HANGER CLOSEST TO THE RESTRAINT SHALL BE OF A TYPE THAT RESISTS UPWARD MOVEMENT OF A BRANCH LINE SUCH AS A SURGE CLIP

EARTHQUAKE BRACING DETAILS

LATERAL SYMBOL: FOUR-WAY SYMBOL: LATERAL AND LONGITUDINAL BRACE AS DETAILED, NO MORE THAN 6" APART
LONGITUDINAL SYMBOL:



SEISMIC BRACING NOTES
1. ALL BRACE PIPING SHALL BE 1-INCH SCHEDULE 40 BLACK STEEL.
2. MAX BRACE PIPE LENGTH = 7'-0" (PROVIDE 36" PER BRACE FOR LISTING)
3. MAX LATERAL BRACE SPACING FOR 3" PIPE = 10'-0" U.O.N.
4. MAX LONGITUDINAL BRACE SPACING FOR 3" PIPE = 20'-0" U.O.N.



5 / FX001 FIRE SPRINKLER PLAN
1/8" = 1'-0"

SPRINKLER HEADS

MANUFACTURER	MODEL	TYPE	SIN	FINISH	THREAD	K-FACTOR	CANOPY	ESCUTCH	TEMP	WRENCH	SYMBOL	QUANTITY
RELIABLE	F1-80	PEND	RA6212	WHITE	1/2"	8.0	RECESSED	F1	286	W4	◉	17
RELIABLE	F1FR56	UP	RA1425	BRASS	1/2"	5.6	N/A	N/A	200	W2	○	9
										TOTAL		26

GRAPHIC SCALE : 1/8" = 1'-0"
0' 4' 8' 16' 24'

FIRE SPRINKLER LEGEND

NOTE: ALTERNATE SPRINKLER TEMPERATURES MAY BE NOTED NEXT TO SPRINKLER SYMBOLS I.E. INT. = INTERMEDIATE TEMPERATURE; HIGH = HIGH TEMPERATURE)

SYMBOL	DESCRIPTION
◉	STANDARD SPRAY PENDENT SPRINKLER ON - DROP
○	STANDARD SPRAY UPRIGHT SPRINKLER ON - LINE
	LATERAL OR LONGITUDINAL SWAY BRACE
	COMBINATION LATERAL AND LONGITUDINAL SWAY BRACE
FS	FLOW SWITCH
TS	TAMPER SWITCH
	CHECK VALVE (GROOVED OR THREADED)
	BUTTERFLY VALVE (GROOVED OR THREADED)
	GLOBE VALVE
X.X	PIPE CENTERLINE FROM FINISHED FLOOR
X	HYDRAULIC NODE POINT
X.X	CEILING HEIGHT
	RISER
*	CENTERLINE DISTANCE OF PIPE FROM DECK
	FLANGE
	GROOVED ELBOW UP
	GROOVED ELBOW DOWN
	GROOVED COUPLING
	SCREWED ELBOW UP
	SCREWED ELBOW DOWN
	HANGER SYMBOL - SEE DETAIL FOR TYPE
	NEW WET SPRINKLER PIPE
	NEW UNDERGROUND FIRE SERVICE
AFF	ABOVE FINISHED FLOOR
ATR	ALL THREAD ROD
A.S.	AUTOMATIC SPRINKLER
CIF	CUT IN FIELD
DN	DOWN
FG	FINISHED GRADE
GALV	GALVANIZED
GBE	GROOVE BOTH ENDS
GOE	GROOVE ONE END
GMI	GALVANIZED MALLEABLE IRON
NTS	NOT TO SCALE
OS&Y	OUTSIDE STEM & YOKE
RN	RISER NIPPLE
TBE	THREAD BOTH ENDS
TOE	THREAD ONE END
T&G	THREAD AND GROOVE
UON	UNLESS OTHERWISE NOTED
W/	WITH

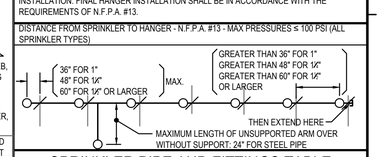
HANGER SPACING REQUIREMENTS

MAXIMUM DISTANCE BETWEEN HANGERS (FT-IN) - N.F.P.A. #13

NOMINAL PIPE SIZE	¾"	1"	1¼"	1½"	2"	2½"	3"	4"	6"	8"
STEEL PIPE	N/A	12-0	12-0	15-0	15-0	15-0	15-0	15-0	15-0	15-0

NOTE:
TYPICAL HANGER SYMBOLS AS SHOWN ON PIPING PLAN MAY NOT REFLECT ACTUAL FIELD INSTALLATION. FINAL HANGER INSTALLATION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF N.F.P.A. #13.

DISTANCE FROM SPRINKLER TO HANGER - N.F.P.A. #13 - MAX PRESSURES ≤ 100 PSI (ALL SPRINKLER TYPES)



SPRINKLER PIPE AND FITTINGS TABLE

MATERIAL NOTES
1. MATERIALS MAY BE OF DOMESTIC OR IMPORT ORIGIN
2. SEE INDIVIDUAL PIPE CUTS/NOTES FOR VARIATION IN FINISH OR FITTINGS

PIPE SIZE	PIPE	FITTINGS AND OUTLETS
1"	SCHEDULE 40	BLACK CLASS-300 DUCTILE IRON THREADED FITTINGS (300 PSI RATED)
1¼"	SCHEDULE 10	WELDED OUTLETS WITH ROLL GROOVED ENDS AND PAINTED DUCTILE IRON STANDARD-RADIUS GROOVED FITTINGS
2" TO 4"	SCHEDULE 10	WELDED OUTLETS WITH ROLL GROOVED ENDS AND PAINTED DUCTILE IRON SHORT-RADIUS GROOVED FITTINGS

FIRE SPRINKLER GENERAL NOTES

1. FIRE PROTECTION SYSTEM SHALL BE DESIGNED, INSTALLED, TESTED, AND FLUSHED IN ACCORDANCE WITH:
   - INTERNATIONAL BUILDING CODE (IBC) - 2024 EDITION WITH LOCALLY ADOPTED MODIFICATIONS
   - NFPA 13 (STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS) - 2022 EDITION
   - ASCE/SEI 7 - MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES
2. NO INSTALLATION OF ANY PIPING OR EQUIPMENT IS TO BEGIN PRIOR TO APPROVAL OF PLANS BY THE AUTHORITY HAVING JURISDICTION AND THE OWNER'S REPRESENTATIVE.
3. ALL PAINTING OF FIRE PROTECTION PIPING AND RELATED COMPONENTS TO BE PERFORMED BY OTHER TRADE DIVISIONS.
4. ALL ELECTRICAL WIRING OF FIRE ALARM SYSTEM AND FIRE SPRINKLER ELECTRICAL COMPONENTS TO BE PERFORMED BY OTHER TRADE DIVISIONS. FIRE SPRINKLER SYSTEM SHALL BE SUPERVISED IN ACCORDANCE WITH THE INTERNATIONAL BUILDING CODE AND NFPA 72 (NATIONAL FIRE ALARM CODE).
5. THE STRUCTURAL ADEQUACY OF THE BUILDING TO SUPPORT THE SPRINKLER PIPING IS THE RESPONSIBILITY OF THE OWNER AND/OR HIS STRUCTURAL REPRESENTATIVE. SYSTEM DESIGN ACCOUNTS FOR NO PENETRATIONS IN STRUCTURAL MEMBERS UNLESS OTHERWISE NOTED. OBTAIN APPROVALS FROM THE STRUCTURAL ENGINEER PRIOR TO PENETRATING ANY STRUCTURAL MEMBERS DUE TO FIELD CHANGES.
6. IT IS THE OWNERS RESPONSIBILITY TO PROVIDE ADEQUATE HEAT TO PREVENT FREEZING THROUGHOUT WET PIPE SPRINKLER SYSTEM AREAS AND IN ENCLOSURES FOR DRY PIPE AND OTHER TYPES OF VALVES CONTROLLING WATER SUPPLIES TO SPRINKLER SYSTEMS.

COFFMAN ENGINEERS
751 Osterman Dr,
Suite 104
Bozeman, MT 59715
ph 406.582.1936
www.coffman.com

Professional Engineer (Fire Protection) MARK S. GOUVEIA 10558 2/5/2025 WYOMING

NELSON ENGINEERING since 1964
Professional Engineers & Land Surveyors
JACKSON, WY • BUFFALO, WY • VICTOR, ID

APPROVALS & COORDINATION:
JACKSON FIRE MARSHALL

PROJECT:
HIGH SCHOOL ROAD WELL HOUSE
2505 SHOOTIN IRON RANCH RD,
JACKSON, WY
83001-9493

CLIENT:
TOWN OF JACKSON, WY

REV	DATE	DESCRIPTION

PROJ. NO. 250174
DRAWN S. HAYSLEY
CHECKED L. QUALM
DATE 2/6/2025

© COFFMAN ENGINEERS INC.

SHEET TITLE:
SITE PLAN, RISER, DETAILS AND LEGEND, FIRE SPRINKLER PLAN

SHEET NO:
FX001

P:\BOZ25\JOBS\250174 HIGH SCHOOL ROAD WELL HOUSE\0 DWGS\PP250174 - HIGH SCHOOL ROAD WELL HOUSE - SHOP DRAWINGS.DWG FX001 - HAYSLEY, STEPHEN - LAST SAVED: February 6, 2025 - PLOT DATE: 2/7/25

ELECTRICAL LIGHTING FIXTURE LEGEND

- SURFACE PANEL LIGHT
  - NORMAL POWER
  - BACKUP POWER
- RECESSED PANEL LIGHT
  - NORMAL POWER
  - BACKUP POWER
- LINEAR LIGHT - SURFACE OR SUSPENDED
  - NORMAL POWER
  - BACKUP POWER
- SURFACE WALL MOUNT LED FIXTURE
  - NORMAL POWER
  - BACKUP POWER
- POLE MOUNTED FIXTURE
- LIGHTED IN-GROUND BOLLARD
  - FORWARD LIGHT
  - ANNULAR LIGHT
- PENDANT FIXTURE; HIGH BAY, LOW BAY, DECORATIVE
- EXIT SIGN - WALL MOUNT, CEILING MOUNT. ARROW INDICATES DIRECTION OF TRAVEL, SHADING INDICATES LIGHTED FACE.
- DUAL HEAD EMERGENCY EGRESS BATTERY PACK, WALL MOUNT OR CEILING MOUNT
- WALL MOUNTED SCONCE
- SURFACE DOWNLIGHT
- SURFACE EMERGENCY DOWNLIGHT
- RECESSED CAN DOWNLIGHT
- RECESSED CAN EMERGENCY DOWNLIGHT
- RECESSED CAN WALL WASHER
- TRACK LIGHTING. SEE FIXTURE SCHEDULE AND LIGHTING PLANS.

ELECTRICAL LIGHTING CONTROL LEGEND

STANDARD LIGHTING CONTROLS: SWITCHES AND LINE VOLTAGE DIMMERS	DIGITAL LIGHTING CONTROLS: ROOM CONTROLLERS AND LOW VOLTAGE DEVICES
TOGGLE SWITCH (MOUNT AT +46", UNO) "X" INDICATES TYPE: BLANK - SINGLE POLE 3 - INDICATES THREE-WAY 4 - INDICATES FOUR-WAY D - INDICATES DIMMER SWITCH PHILIPS SUNRISE - ON/OFF K - INDICATES KEYED SWITCH T - INDICATES TIMER P - INDICATES PILOT LIGHT OS - INDICATES WALL SWITCH OCC SENSOR WATTSTOPPER DW100 (SINGLE OR DUAL DW-200 SWITCH) OSD - INDICATES WALL SWITCH OCC SENSOR WITH 0-10V DIMMING - WATTSTOPPER W-311 "Y" INDICATES ROOM AND ZONE: 1a - INDICATES SINGLE POLE LIGHTING SWITCH ZONE FOR ZONE a IN ROOM 1 1b - INDICATES SINGLE POLE LIGHTING SIWTCH ZONE FOR ZONE b IN ROOM 1 1 - INDICATES LIGHTING SWITCHES WITH MULTIPLE ZONES IN ROOM 1	OCCUPANCY SENSOR - CEILING MOUNT, WALL MOUNT WATTSTOPPER LMDC-100, OR EQUAL
	PHOTOCELL - CEILING MOUNT WATTSTOPPER LMLS-400, OR EQUAL
	ON/OFF ROOM CONTROLLER WITH (1) RELAY WATTSTOPPER DLM LMRC-101, OR EQUAL
	ON/OFF ROOM CONTROLLER WITH (2) RELAYS WATTSTOPPER DLM LMRC-102, OR EQUAL
	ON/OFF/0-10V ROOM CONTROLLER WITH (1) RELAYS WATTSTOPPER DLM LMRC-211, OR EQUAL
	ON/OFF/0-10V ROOM CONTROLLER WITH (2) RELAYS WATTSTOPPER DLM LMRC-212, OR EQUAL
	ON/OFF/0-10V ROOM CONTROLLER WITH (3) RELAYS WATTSTOPPER DLM LMRC-213, OR EQUAL
OCCUPANCY SENSOR - WALL MOUNT, CEILING MOUNT. WATTSTOPPER DT-300 DUAL TECHNOLOGY, OR EQUAL, WITH BZ-50 POWER PACKS AS NEEDED.	LOW VOLTAGE DIMMING SWITCH WATTSTOPPER DLM LMDM-101, OR EQUAL
PHOTOCELL - CEILING MOUNT, WATTSTOPPER LS-301, OR EQUAL	
MOTION SENSOR - WALL MOUNT, CEILING MOUNT. WITH BZ-50 POWER PACKS AS NEEDED	

ELECTRICAL ONE-LINE LEGEND

- CT AND CUSTOMER POWER METER
- MOTOR SYMBOL
- UTILITY ELECTRIC METER AND BASE (BASE BY CUSTOMER)
- SURGE PROTECTION DEVICE
- LIGHTNING ARRESTOR
- STRESS RELIEF CONE
- POWER FACTOR CORRECTION CAPACITOR
- MOTOR STARTER SWITCH W/ THERMAL OVERLOADS
- CONTACTOR NORMALLY OPEN, NORMALLY CLOSED
- TRANSFORMER, 3-PH, 3-WIRE DELTA CONNECTION
- TRANSFORMER, 3-PH, 4-WIRE GROUNDED WYE CONNECTION
- AUTOMATIC TRANSFER SWITCH
- VARIABLE FREQUENCY DRIVE
- HARMONIC FILTER
- FIXED MOUNT LV BREAKER
- FUSED SWITCH ("XXAS/XXAF" - SW AND FUSE AMP RATING)
- GENERATOR
- WALL MOUNTED BREAKER
- THERMAL OVERLOAD ELEMENT
- DISCONNECT SWITCH ("XXAS" = SWITCH AMP RATING)
- FUSED DISCONNECT SWITCH ("XXAS/XXAF" = SW AND FUSE AMP RATING)
- COMBINATION MOTOR STARTER (STR SIZE, TYP, AS, AF, SEE MEP COORDINATION SCHEDULE)
- SWITCHBOARD OR PANELBOARD; NAME, VOLTAGE, PHASE, NUMBER OF WIRES WHEN INDICATED

ELECTRICAL LOW VOLTAGE LEGEND

FIRE ALARM SYSTEM	TELEPHONE/DATA SYSTEM
SPRINKLER PRESSURE SWITCH	TELEPHONE OUTLET (MOUNT AT +18", UNO). SEE NOTE.
SPRINKLER FLOW SWITCH	VOICE-DATA OUTLET (MOUNT AT +18", UNO). SEE NOTE.
SPRINKLER TAMPER SWITCH	DATA OUTLET (MOUNT AT +18", UNO). SEE NOTE.
HEAT DETECTOR	WIRELESS ACCESS POINT
SMOKE DETECTOR - PHOTO-ELECTRIC	CABLE TRAY OR BASKET TRAY - LENGTH AND HEIGHT PER PLAN
DUCT SMOKE DETECTOR	NOTE: PROVIDE ROUGH-IN ONLY. SINGLE GANG BOX WITH MUD RING & 1" C. STUBBED UP TO ACCESSIBLE CEILING SPACE.
SINGLE-STATION SMOKE DETECTOR. PROVIDE 120V AND MONITOR AT FACP VIA RELAY.	**SECURITY SYSTEM**
COMBINATION SMOKE AND CARBON MONOXIDE DETECTOR	CARD READER - SEE ELECTRICAL DETAILS FOR ROUGH-IN (MOUNT AT +46", OR MATCH ADJACENT DOOR ACCESS CONTROL)
HEAT DETECTOR "X" INDICATES TYPE: RC - COMBINATION RATE-OF-RISE HEAT AND CO DETECTOR	REQUEST TO EXIT MOTION DETECTOR
DOOR HOLDER	DOOR CONTACTS
MANUAL STATION (MOUNT AT +46", UNO)	ELECTRIC STRIKE
STROBE - WALL MOUNT (+90"), CEILING MOUNT	ELECTRIC LOCK
HORN/STROBE - WALL MOUNT (+90"), CEILING MOUNT	MOTION DETECTOR
SPEAKER STROBE - WALL MOUNT (+90"), CEILING MOUNT	GLASS BREAK DETECTOR
	CCTV CAMERA - CEILING MOUNT OR WALL MOUNT. SEE NOTE.
	NOTE: PROVIDE ROUGH-IN ONLY. 2-GANG BOX WITH MUD RING & 1" C. STUBBED UP TO ACCESSIBLE CEILING SPACE.

ELECTRICAL POWER LEGEND

- PANELBOARD OR LOAD CENTER
- PANEL AND CIRCUIT DESIGNATION ARE SHOWN NEXT TO EACH DEVICE (PANEL NAME - CIRCUIT NUMBER). A SINGLE INSULATED GREEN GROUND CONDUCTOR SHALL BE PROVIDED WITH EACH HOME RUN. PROVIDE A SEPARATE NEUTRAL FOR EACH CIRCUIT. HOME RUNS SHALL HAVE NO MORE THAN THREE CIRCUITS. LINE VOLTAGE AND LOW VOLTAGE WIRING IS NOT SHOWN ON PLANS.
  "X" INDICATES TYPE:
  GFI - GROUND FAULT INTERRUPTER
  WP - WEATHERPROOF WHILE-IN-USE COVER
  U - PROVIDE WITH (2) USB PORTS
- SIMPLEX RECEPTACLE - CEILING MOUNT, WALL MOUNT (+18", UNO)
- DUPLEX RECEPTACLE - CEILING MOUNT, WALL MOUNT (+18", UNO)
- QUADRUPLEX RECEPTACLE - CEILING MOUNT, WALL MOUNT (+18", UNO)
- ABOVE COUNTER RECEPTACLE - MOUNT AT +4" ABOVE BACKSPLASH
- HALF-HOT RECPTACLE (SWITCH FOR SIMPLEX)
- FLOOR BOX WITH QUADRUPLEX RECEPTACLE - WITH (2) TELE/DATA PORTS, WITHOUT TELE/DATA. INCLUDE ALL HARDWARE/ACCESSORIES AS REQUIRED. PROVIDE COVER (COORDINATE WITH ARCHITECT FOR FLOORING TYPE AND FINISH).
  "X" INDICATES TYPE:
  A - 4-GANG FLOOR BOX, CORROSION RESISTANT COATING FOR CONCRETE FLOORS (3" MIN. POUR DEPTH), UP TO 2" CONDUIT FEED (HUBBELL NO. CFB4G30CR, OAE)
  B - 4-GANG FLOOR BOX FOR RAISED ACCESS FLOORS, UP TO 2" CONDUIT FEED (HUBBELL NO. AFB4G50, OAE)
  C - FIRE RATED POKE-THROUGH FLOOR BOX FOR ELEVATED CONCRETE SLABS, 3" DIA. CORE (HUBBELL NO. PT7FSD, OAE)
  D - 8" DIA., FIRE RATED POKE-THROUGH FLOOR BOX FOR ELEVATED CONCRETE SLABS, UP TO 2" CONDUIT FEED (HUBBELL NO. S1R8PTFIT3, OAE)
  E - FLUSH, ROUND SINGLE SURFACE FLOOR BOX FOR CONCRETE FLOORS, UP TO 1" CONDUIT FEED (HUBBELL NO. B2506, OAE)
  F - TOMBSTONE PEDESTAL FLOOR BOX, 1" CONDUIT FEED (HUBBELL NO. 6301, OAE)
- SPECIAL PURPOSE RECEPTACLE (MOUNT AT +18", UNO)
  "X" INDICATES TYPE:
  A - NEMA 5-20R, #12 CU; B - NEMA 5-30R, #10 CU;
  C - NEMA 5-50R, #8 CU; D - NEMA 6-20R, #12 CU;
  E - NEMA 6-30R, #10 CU; F - NEMA 6-50R, #8 CU;
  G - NEMA 14-20R, #12 CU; H - NEMA 14-30R, #10 CU;
  I - NEMA 14-50R, #8 CU
- PUSHBUTTON (MOUNT AT +46", UNO)
  "X" INDICATES TYPE:
  EPO - EMERGENCY POWER OFF
  ADA - HANDICAPPED ACCESSIBLE DOOR (DEVICE BY OTHERS)
  ODO - OVERHEAD DOOR OPERATOR (DEVICE BY OTHERS)
- FLATSCREEN TV BOX: 2-GANG, FLUSH IN WALL, HUBBELL RACO NSAV62M, WITH NSAV6C COVER. DUPLEX RECEPTACLE & SINGLE GANG DATA PORT. MOUNT AT + 72", UNO.
- JUNCTION BOX
- DROP-DOWN RECEPTACLE
- SURFACE MOUNTED PLUGSTRIP
  "X" INDICATES TYPE:
  A - PLUGSTRIP, POWER ONLY, OUTLET EVERY 3' OC
  B - WIREMOLD SERIES 4000 POWER AND DATA
  C - WIREMOLD SERIES 5000 POWER AND DATA
- SURFACE MOUNTED RACEWAY
- RACEWAY CONCEALED IN WALL, FLOOR, OR CEILING IN FINISHED SPACES, EXPOSED IN UNFINISHED SPACES
- RACEWAY BELOW FLOOR OR BELOW GRADE
- RACEWAY STUB-OUT WITH CAPPED END
- RACEWAY STUB-OUT WITH BRUSHED END
- GROUNDING BUS

SHEET LIST - ELECTRICAL

E0.0	ELECTRICAL COVER SHEET
E0.1	ELECTRICAL SPECIFICATIONS
E1.0	POWER MAIN LEVEL
E2.0	LIGHTING MAIN LEVEL
E3.0	ONE LINE DIAGRAM
E4.0	PANEL SCHEDULES

ABBREVIATIONS AND SYMBOLS GENERAL NOTES

A. THE ABBREVIATIONS ON THIS SHEET COMPRISE A STANDARD LIST; NOT ALL ABBREVIATIONS APPEAR ON THIS PROJECT.

B. THE SYMBOLS ON THIS SHEET COMPRISE A STANDARD LIST; NOT ALL SYMBOLS APPEAR ON THIS PROJECT.

C. ALL MOUNTING HEIGHTS ARE TO CENTER OF DEVICE ABOVE FINISHED FLOOR, UNLESS NOTED OTHERWISE. MOUNTING HEIGHTS INDICATED ON ARCHITECTURAL WALL ELEVATIONS OR AS NOTED SPECIFICALLY ON THE DRAWINGS OR IN THE SPECIFICATIONS SHALL TAKE PRECEDENCE OVER MOUNTING HEIGHTS LISTED.

ELECTRICAL GENERAL NOTES

A. PRIOR TO BID CONTRACTOR SHALL VISIT THE SITE. NOT ALL WORK REQUIRED TO COMPLETE THE PROJECT IS SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL BECOME THOROUGHLY FAMILIAR WITH ALL THE WORK REQUIRED TO COMPLETE THE PROJECT IN ADDITION TO THE LOCAL CONDITIONS AND INCLUDE SAID WORK IN THE BID.

B. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF ALL ELECTRICAL SERVICE WORK WITH UTILITY. OWNER PAYS ALL FEES, CONTRACTOR DOES ALL SCHEDULING AND COORDINATION OF WORK. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE ALL SCHEDULES ARE MET.

C. GENERAL WORK PRACTICES FOR ELECTRICAL CONSTRUCTION SHALL BE IN ACCORDANCE WITH NECA 1, "STANDARD PRACTICES FOR GOOD WORKMANSHIP IN ELECTRICAL CONTRACTING." THIS PUBLICATION IS AVAILABLE FROM NECA BY TELEPHONE AT 301-657-3110 OR ON-LINE AT WWW.NECANET.ORG.

D. DURING DEMOLITION, THE CONTRACTOR SHALL NOTE ALL EXISTING RACEWAY (BOTH SURFACE AND CONCEALED) TO THE EXTENT POSSIBLE. THESE RACEWAYS SHALL BE REUSED TO THE GREATEST EXTENT POSSIBLE TO INSURE A CLEAN FINISHED PRODUCT. WHERE PRACTICAL, AND ALLOWED PER CODE, FISHING THROUGH WALLS WITH MC CABLE IS PREFERRED TO SURFACE-MOUNTED CONDUIT.

E. CONTRACTOR SHALL REMOVE, TRANSPORT, AND LEGALLY DISPOSE OF LAMPS AND BALLASTS OFF-SITE. IT IS ASSUMED THE THE BALLASTS DO NOT CONTAIN PCBs. THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY IF IT IS SUSPECTED THAT BALLASTS CONTAIN PCBs.

F. ALL POWER INTERRUPTIONS SHALL BE COORDINATED WITH OWNER. ANY DISRUPTION OF WORKERS IN THE SPACE SHALL BE KEPT TO A MINIMUM AND BE COORDINATED WITH THE OWNER PRIOR TO WORK COMMENCING IN THAT SPACE.

G. CONTRACTOR SHALL EXTEND UNSWITCHED HOT LEG FROM EXISTING EMERGENCY FIXTURE LOCATION TO NEW EMERGENCY FIXTURES. AS NEEDED. SEE DEMO PLANS FOR AN APPROXIMATION OF EXISTING EMERGENCY FIXTURE LOCATIONS. FIELD VERIFY EXACT LOCATION PRIOR TO BID.

H. IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE WITH MECHANICAL FOR PLENUM SPACES AND PROVIDE PLENUM RATED CABLES WHERE REQUIRED FOR LIGHTING CONTROL, DATA, FIRE ALARM AND ALL OTHER L.V. SYSTEMS NOT INSTALLED IN CONDUIT. VERIFY CONDUIT REQUIREMENTS ON DRAWINGS AND SPECIFICATIONS.

I. FIRE-RESISTANCE: PROVIDE A MINIMUM HORIZONTAL DISTANCE OF 24" BETWEEN OUTLET BOXES LOCATED ON OPPOSITE SIDES OF FIRE-RESISTANCE RATED WALLS. WHERE THIS IS NOT POSSIBLE INSTALL UL LISTED PUTTY PADS ON ALL OUTLET BOXES NOT MEETING THE 24" SEPARATION. PROVIDE A UL LISTED THROUGH - PENETRATION FIRESTOP FOR PENETRATIONS OF FIRE-RESISTANCE RATED ASSEMBLIES.

J. CONDUCTORS ARE SIZED PER THE 75 DEGREE C RATING COLUMN OF NEC TABLE 310.16. IF THE TERMINAL USED FOR A TERMINATION OF A PARTICULAR CONDUCTOR IS NOT MARKED, OR THE TERMINAL IS MARKED FOR 60 DEGREE C CONDUCTORS, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO EITHER ADJUST THE AMPACITY OF THE CONDUCTOR TO MATCH THE 60 DEGREE COLUMN OF TABLE 310.16, OR REPLACE THE TERMINAL WITH ONE RATED FOR AT LEAST 75 DEGREES C.

K. BASED ON ACTUAL HOMERUN LENGTHS REQUIRED IN THE FIELD, THE CONTRACTOR SHALL CALCULATE AND INCREASE THE WIRE SIZES AS REQUIRED TO LIMIT BRANCH CIRCUIT VOLTAGE DROP TO 3%. FOR 20A BRANCH CIRCUITS THE MINIMUM CONDUCTOR SIZES SHALL BE AS FOLLOWS: #10 AMG CU FOR RUNS BETWEEN 100 AND 200 LINEAR FEET, #8 AWG CU FOR RUNS BETWEEN 200 AND 325 LINEAR FEET, ANS AS CALCULATED BY THE CONTRACTOR FOR CIRCUITS EXTENDING BEYOND 325 LINEAR FEET. IN ALL CASES WHERE WIRE SIZES INCREASE, THE CONTRACTOR SHALL PROVIDE LARGER CONDUITS AS REQUIRED.

L. PROVIDE A DEDICATED NEUTRAL CONDUCTOR FOR EACH 120V BRANCH CIRCUIT.

M. IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INVOLVED TO COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, DIFFUSERS, BOXES, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

N. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING OF FLOORS, WALLS, CEILINGS, AND ROOFS TO PERFORM THE REQUIRED WORK DEPICTED IN THESE DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR ALL PATCHING OF HOLES TO THE SATISFACTION OF THE ARCHITECT/ENGINEER.

O. ELECTRICAL CONTRACTOR SHALL ADHERE TO THE LATEST ADOPTED VERSION OF ALL APPLICABLE CODES AND ANY LOCAL ADDENDUM TO THOSE CODES.

ELECTRICAL ABBREVIATIONS LEGEND

A, AMP	AMPERES	MAN	MANUAL
AC	ALTERNATING CURRENT	MAX	MAXIMUM
A/C	AIR CONDITIONING	MCA	MINIMUM CIRCUIT AMPACITY
AF	AMP FUSE	MCC	MOTOR CONTROL CENTER
AFF	ABOVE FINISHED FLOOR	MDP	MAIN DISTRIBUTION PANEL
AFG	ABOVE FINISHED GRADE	MECH	MECHANICAL
AHU	AIR HANDLING UNIT	MH	METAL HALIDE
AL	ALUMINUM	MIN	MINIMUM
AS	AMP SWITCH	MSS	MOTOR STARTER SWITCH WITH THERMAL OVERLOADS
ATS	AUTOMATIC TRANSFER SWITCH	N	NEUTRAL
BAS	BUILDING AUTOMATION SYSTEM	NC	NORMALLY CLOSED
BKR	BREAKER	NEC	NATIONAL ELECTRIC CODE
C	RACEWAY/CONDUIT	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
CB	CIRCUIT BREAKER		
CCTV	CLOSED CIRCUIT TELEVISION	NFD	NON-FUSED DISCONNECT
CKT	CIRCUIT	NIC	NOT IN CONTRACT
CLG	CEILING	NO	NORMALLY OPEN
C.O.	RACEWAY/CONDUIT ONLY, WITH PULL STRING	#	NUMBER
CNTRL	CONTROL	OAE	OR APPROVED EQUAL
CU	COPPER	OC	ON CENTER
D	EXISTING TO BE DEMOLISHED	OCPD	OVERCURRENT PROTECTIVE DEVICE
DISC	DISCONNECT	OH	OVERHEAD
DIST	DISTRIBUTION	P	POLE
DPDT	DOUBLE POLE DOUBLE THROW	PB	PUSHBUTTON
DWG	DRAWING	PH	PHASE
EA	EACH	PNL	PANEL
EF	EXHAUST FAN	PVC	POLYVINYL CHLORIDE CONDUIT
ELEC	ELECTRIC	PWR	POWER
EMT	ELECTRICAL METALLIC TUBING	R	EXISTING TO REMAIN
EQUIP	EQUIPMENT	RCPT	RECEPTACLE
EX, EXIST	EXISTING	RECEPT	RECEPTACLE
FA	FIRE ALARM	RGS	RIGID GALVANIZED STEEL
FAA	FIRE ALARM ANNUNCIATOR	RM	ROOM
FACP	FIRE ALARM CONTROL PANEL	RVNR	REDUCED VOLTAGE NON-REVERSING
FCU	FAN COIL UNIT	RVR	REDUCED VOLTAGE REVERSING
FD	FUSED DISCONNECT	SF	SINEWAVE FILTER
FLR	FLOOR	SP	SINGLE POLE TOGGLE SWITCH
FO	FIBER OPTIC	SPD	SURGE PROTECTIVE DEVICE (TVSS)
FSD	FIRE SMOKE DAMPER RELAY, CONTROLLED BY ASSOCIATED SMOKE DETECTOR AND CIRCUITED BACK TO FACP	SPEC	SPECIFICATION
		SPST	SINGLE POLE SINGLE THROW
		SSPB	START-STOP PUSHBUTTON
FVNR	FULL VOLTAGE NON-REVERSING	SW	SWITCH
FVR	FULL VOLTAGE REVERSING	SWBD	SWITCHBOARD
GEC	GROUNDED ELECTRODE CONDUCTOR	SWGR	SWITCHGEAR
GFCI	GROUND FAULT CIRCUIT INTERRUPER	TB	TELEPHONE BOARD
GFI	GROUND FAULT INTERRUPTER	TC	TIME CLOCK
GFP	GROUND FAULT PROTECTION	TD	TIME DELAY
GND	GROUND	TEL	TELEPHONE
GRC	GALVANIZED RIGID CONDUIT	TSP	TWISTED SHIELDED PAIR
HF	HARMONIC FILTER	TTB	TELEPHONE TERMINAL BOARD
HID	HIGH INTENSITY DISCHARGE	TYP	TYPICAL
HOA	HAND-OFF-AUTOMATIC	UG	UNDERGROUND
HP	HORSEPOWER	UH	UNIT HEATER
HPS	HIGH PRESSURE SODIUM	UNO	UNLESS NOTED OTHERWISE
HTR	HEATER	V	VOLT
HVAC	HEATING, VENTILATION & AIR CONDITIONING	VA	VOLT-AMPERES
HZ	HERTZ	VFD	VARIABLE FREQUENCY DRIVE
J-BOX	JUNCTION BOX	W	WATTS
KVA	KILOVOLT-AMPERES	WP	WEATHERPROOF
KW	KILOWATTS	W/O	WITHOUT
LCP	LIGHTING CONTROL PANEL	XFMR	TRANSFORMER
LPW	LUMENS PER WATT	Y	WYE-CONNECTED
LTG	LIGHTING	Δ	DELTA-CONNECTED
LV	LOW VOLTAGE	ø	PHASE
MAG	MAGNETIC STARTER		

Professional Engineer
DAVID MAGNO
18907
STATE OF WYOMING
Date 4/30/2026
WYOMING

Revisions

#	Description	Date

Drawing Title
ELECTRICAL COVER SHEET

Date
2026.04.16

Mechanical:
Engineered Solutions
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TOWN HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
ARCH 5, LLC
mail PO Box 4055 Jackson, WY 83001
office 610 W Broadway Ave #103 Jackson, WY 83001
phone 307.249.8650

E0.0

ELECTRICAL SPECIFICATIONS

RACEWAY:
- MINIMUM RACEWAY SIZE: 3/4-INCH TRADE SIZE.

OUTDOORS:
- EXPOSED CONDUIT: RIGID STEEL CONDUIT.
- CONCEALED CONDUIT, ABOVE GROUND: EMT.
- UNDERGROUND CONDUIT: RNC, TYP EPC-40-PVC, DIRECT BURIED. USE TYPE EPC-80-PVC UNDER PAVED SURFACES.
- CONNECTION TO VIBRATING EQUIPMENT (INCLUDING TRANSFORMERS AND HYDRAULIC, PNEUMATIC, ELECTRIC SOLENOID,OR MOTOR-DRIVEN EQUIPMENT): LFNC.
- BOXES AND ENCLOSURES, ABOVE GROUND: NEMA250, TYPE 3R.

INDOOR:
- EXPOSED, NOT SUBJECT TO PHYSICAL DAMAGE: EMT.
- EXPOSED AND SUBJECT TO SEVERE PHYSICAL DAMAGE: RIGID STEEL CONDUIT.
- CONCEALED IN NEW CEILINGS AND INTERIOR WALLS AND PARTITIONS: EMT.
- CONNECTION TO VIBRATING EQUIPMENT (INCLUDING TRANSFORMERS AND HYDRAULIC, PNEUMATIC, ELECTRIC SOLENOID, OR MOTOR-DRIVEN EQUIPMENT): FMC, EXCEPT USE LFMC IN DAMP OR WET LOCATIONS.
- DAMP OR WET LOCATIONS: RIGID STEEL CONDUIT.
- BOXES AND ENCLOSURES: NEMA 250, TYPE 1, EXCEPT USE NEMA 250, TYPE 3R, NONMETALLIC IN DAMP OR WET LOCATIONS.
- RACEWAY FITTINGS: COMPATIBLE WITH RACEWAYS AND SUITABLE FOR USE AND LOCATION.
- RIGID AND INTERMEDIATE STEEL CONDUIT: USE THREADED RIGID STEEL CONDUIT FITTINGS, UNLESS NOTED OTHERWISE.

CONDUCTORS:
- ALL CONDUCTORS IN RACEWAY: TYPE THHN-THWN, SINGLE CONDUCTORS.
- COPPER. SOLID FOR NO. 10 AWG AND SMALLER, STRANDED FOR NO. 8 AWG AND LARGER.
- CONCEALED IN NEW CEILINGS AND WALLS: TYPE THHN-THWN, SINGLE CONDUCTORS.

PANELBOARDS:
- ALL PANELBOARDS SHALL BE FULLY RATED.
- ALL PANELBOARDS AND DISCONNECTS TO BE HARD-LABELED (HARD PLASTIC ENGRAVED).

DISCONNECTS:
- ALL DISCONNECTS SHALL BE HEAVY DUTY RATED.

WIRING DEVICES:
- STRAIGHT BLADE RECEPTACLES
  - CONVENIENCE RECEPTACLES, 125V, 20A: COMPLY WITH NEMA WD 1, NEMA WD 6 CONFIGURATION 5-20R, AND UL 498.
  - COOPER: 5351 (SINGLE), 5352 (DUPLEX).
  - HUBBELL: HBL5351 (SINGLE), CR5352 (DUPLEX).
  - UNFINISHED SPACES: PROVIDE GRAY DEVICE IN 4-SQUARE BOX WITH WHITE NYLON COVERS.
  - FINISHED SPACES: PROVIDE WHITE DEVICE IN 4-SQUARE BOX WITH WHITE NYLON COVERS.
- GFCI RECEPTACLES:
  - GENERAL DESCRIPTION: STRAIGHT BLADE, NON-FEED-THROUGH TYPE. COMPLY WITH NEMA WD 1, NEMA WD 6, UL 498, AND UL 943, CLASS A, AND INCLUDE INDICATOR LIGHT THAT IS LIGHTED WHEN DEVICE IS TRIPPED.
  - DUPLEX GFCI CONVENIENCE RECEPTACLES: 125 V, 20 A.
  - COOPER: GF20.
  - UNFINISHED SPACES: PROVIDE GRAY DEVICE IN 4-SQUARE BOX WITH GALVANIZED STEEL COVERS.
  - FINISHED SPACES: PROVIDE WHITE DEVICE IN 4-SQUARE BOX WITH WHITE NYLON COVERS.
- SNAP SWITCHES:
  - SWITCHES, 120/277 V, 20 A: COMPLY WITH NEMA WD 1 AND UL 20.
  - COOPER: 2221 (SINGLE POLE), 2222 (TWO POLE), CS1223 (THREE WAY), 2224 (FOUR WAY).
  - HUBBELL: CS1221 (SINGLE POLE), CS 1222 (TWO POLE), CS1223 (THREE WAY), CS1224 (FOUR WAY).
  - LEVITON: 1221-2 (SINGLE POLE), 1222-2 (TWO POLE), 1223-2 (TWO POLE), 1223-2 (THREE WAY), 1224-2 (FOUR WAY).

FA SYSTEM:
- GENERAL DESCRIPTION: NON-CODED, ADDRESSABLE SYSTEM, WITH MULTIPLEXED SIGNAL TRANSMISSION, DEDICATED TO FIRE-ALARM SERVICE ONLY.
- DESIGNED BY LEVEL 4 DESIGNER, INSTALLED BY LEVEL 2 TECHNICIAN.
- SHALL COMPLY WITH ALL APPLICABLE SECTIONS OF THE NFPA 72 NATIONAL FIRE ALARM CODE.
- CONTROL PANEL: FLUSH-MOUNT, FIELD-PROGRAMMABLE, MICROPROCESSOR-BASED, MODULAR, POWER-LIMITED DESIGN WITH ELECTRONIC MODULES, COMPLYING WITH UL 864 AND LISTED AND LABELED BY AN NRTL. SILENT KNIGHT MODEL IFP SERIES, OR APPROVED EQUAL.
- NOTIFICATION DEVICES: HORN/STROBES AND STROBES SHALL HAVE ADJUSTABLE OUTPUT LEVEL SETTINGS, AND SHALL COMPLY WITH THE AMERICANS WITH DISABILITIES ACT (ADA) REQUIREMENTS.
- INITIATING DEVICES: HEAT DETECTORS, SMOKE DETECTORS, DUCT SMOKE DETECTORS, AND MANUAL PULL-STATIONS.
- PROVIDE DESIGN SUBMITTALS, INCLUDING ALL DRAWINGS, COMPONENT DATASHEETS, AND CALCULATIONS TO: THE AHJ, ARCHITECT, AND ENGINEER FOR APPROVAL.
- 3RD-PARTY MONITORING REQUIRED.
- SHALL BE COMMISSIONED AND APPROVED BY LOCAL AHJ.
- PROVIDE COMPLETE SET OF AS-BUILT DRAWINGS FOR THE ENTIRE SYSTEM UPON INSTALLATION COMPLETION, INCLUDING, BUT NOT LIMITED TO, THE EXACT LOCATIONS OF ALL EQUIPMENT, CONNECTIONS BETWEEN ALL EQUIPMENT, AND WIRING FOR ALL EQUIPMENT AS THE SYSTEM IS INSTALLED.
- PROVIDE COMPLETE SET OF OPERATION AND MAINTENANCE INSTRUCTIONS.
- PROVIDE COPY OF MANUFACTURER'S WARRANTY FOR ALL EQUIPMENT AND MATERIALS. WARRANTY SHALL BE FOR ALL EQUIPMENT, MATERIALS, INSTALLATION, AND WORKMANSHIP FOR A MINIMUM OF THREE(3) YEARS, UNLESS OTHERWISE SPECIFIED.

METERING:
- COMPLY WITH REQUIREMENTS OF UTILITIES PROVIDING ELECTRICAL POWER SERVICES.
- COORDINATE INSTALLATION AND CONNECTION OF UTILITIES AND SERVICES, INCLUDING PROVISION FOR ELECTRICITY-METERING COMPONENTS.
- METERS WILL BE FURNISHED BY UTILITY COMPANY.
- CURRENT-TRANSFORMER CABINETS: COMPLY WITH REQUIREMENTS OF ELECTRICAL-POWER UTILITY COMPANY.
- METER SOCKETS: COMPLY WITH REQUIREMENTS OF ELECTRICAL-POWER UTILITY COMPANY.
- COMPLY WITH EQUIPMENT INSTALLATION REQUIREMENTS IN NECA 1.
- INSTALL RACEWAYS AND EQUIPMENT ACCORDING TO UTILITY COMPANY'S WRITTEN REQUIREMENTS. PROVIDE EMPTY CONDUITS FOR METERING LEADS AND EXTEND GROUNDING CONNECTIONS AS REQUIRED BY UTILITY COMPANY.

Revisions

#	Description	Date

Drawing Title
ELECTRICAL
SPECIFICATIONS

Date
2025.04.16

Mechanical:
Engineering
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

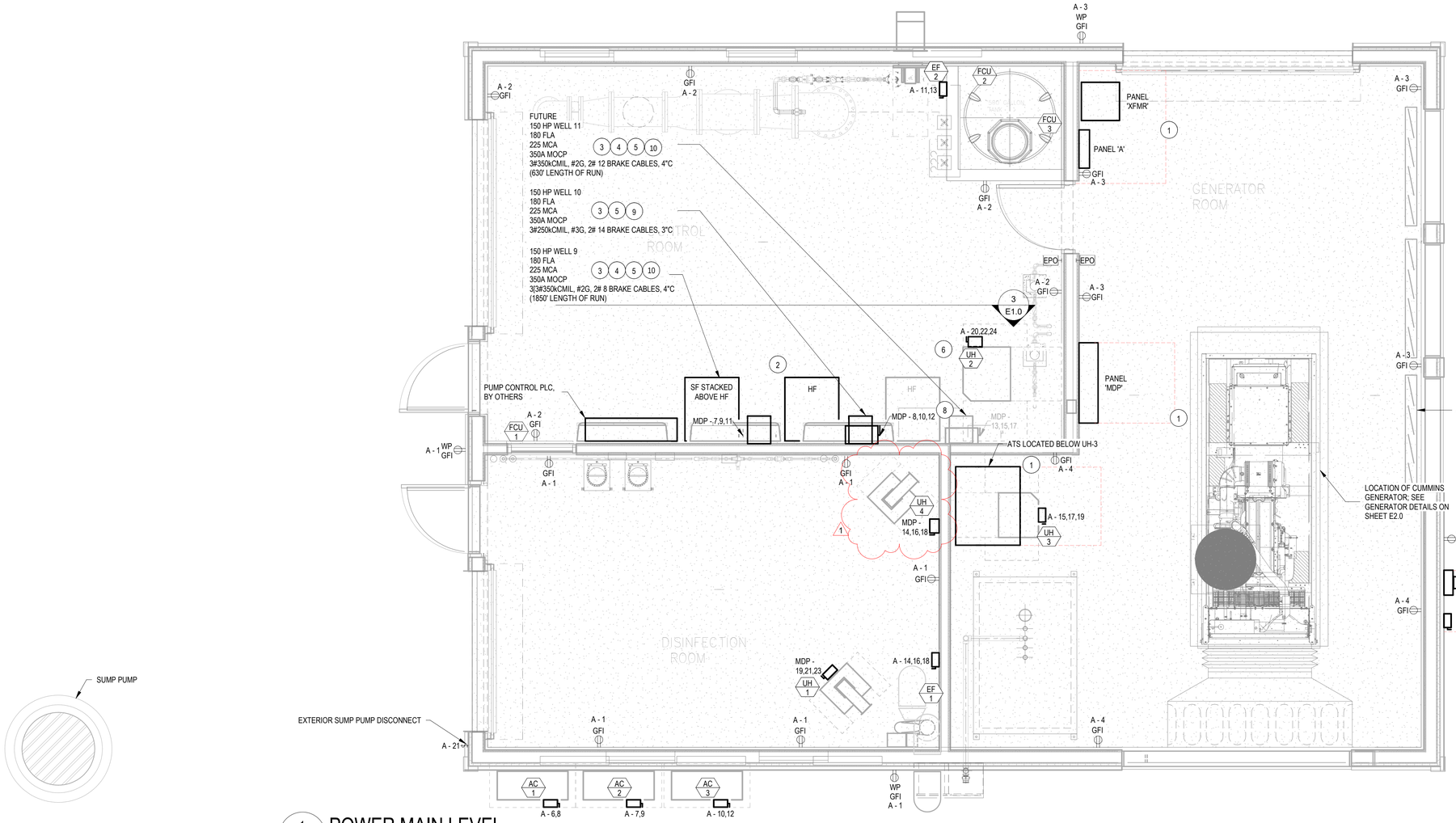
Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Allied 4 LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650



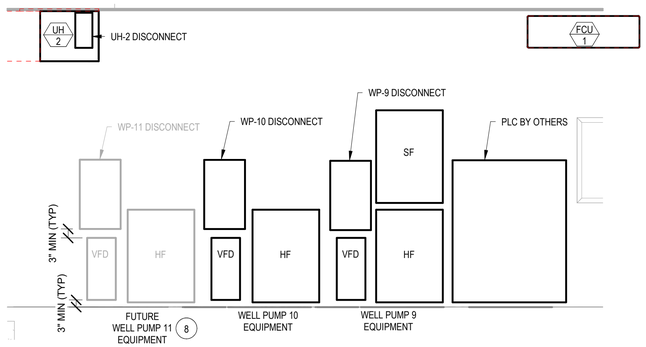
1 E1.0 POWER MAIN LEVEL
SCALE: 3/8" = 1'-0"

GENERAL ELECTRICAL NOTES:

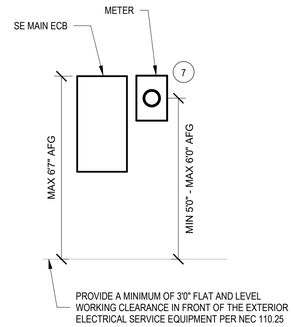
A. IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INVOLVED TO COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, DIFFUSERS, BOXES, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.
B. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING OF FLOORS, WALLS, CEILINGS, AND ROOFS TO PERFORM THE REQUIRED WORK DEPICTED IN THESE DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR ALL PATCHING OF HOLES TO THE SATISFACTION OF THE ARCHITECT/ENGINEER.
C. CONTRACTOR IS FULLY RESPONSIBLE FOR FOLLOWING ALL APPLICABLE CODES AND STANDARDS, AS WELL AS ALL LOCAL ADDENDUM TO THOSE CODES AND STANDARDS, WHETHER SPECIFICALLY SHOWN ON THESE DRAWINGS OR NOT.
D. COMPLY WITH NOTE 1/P1.0 CONCERNING REQUIREMENTS FOR INSTALLATION OF OWNER FURNISHED PROCESS AND ELECTRICAL EQUIPMENT, AND CONTRACTOR'S RESPONSIBILITY TO FURNISH AND INSTALL ALL RACEWAYS AND HIGH AND LOW VOLTAGE CONDUCTORS TO WATER SYSTEM PROCESS AND CONTROLS EQUIPMENT.

KEYED NOTES

1 MAINTAIN WORKING CLEARANCE IN ACCORDANCE WITH NEC 110.26.
2 INSTALL VFD WITH INTEGRAL DISCONNECT SUPPLIED BY OWNER. MAKE/MODEL: ROCKWELL AUTOMATION, POWER FLEX, PF750-FRAM-6-TYPE1
3 ALL DISCONNECTS ON THE LOAD SIDE OF THE VFD SHALL BE PROVIDED WITH BRAKE CABLE CONTACTS. THE PAIR OF BRAKE CABLES ARE TO LANDED ON THE APPROPRIATE CONTACTS IN THE VFD COMMUNICATING THE DOWNSTREAM DISCONNECT IS IN THE OPEN POSITION.
4 ALL WIRING ON THE LOAD SIDE OF VFD TO MOTOR SHALL BE SHIELDED, TWISTED, VFD RATED CABLING WITH INTEGRAL BRAKE CABLES.
5 INSTALL HARMONIC FILTER SUPPLIED BY OWNER. MAKE/MODEL: TCI HSD0200AW11020
6 MAINTAIN WORKING CLEARANCE IN ACCORDANCE WITH NEC 110.26 FOR ALL DISCONNECTS LOCATED AT EQUIPMENT. (TYP)
7 METER WILL BE MOUNTED ON THE TRANSFORMER. COORDINATE WITH CIVIL FOR TRANFORMER LOCATION.
8 LOCATION FOR FUTURE WELL 11 EQUIPMENT.
9 INSTALL SINEWAVE FILTER SUPPLIED BY OWNER. MAKE/MODEL: TCI KMG250A01A
10 INSTALL EXTERIOR BURIED TRAFFIC-RATED PULL/SPLICE BOXES, BURIED CONDUITS AND CONDUCTORS IN ACCORDANCE WITH C1.1. SIZE OF CONDUCTORS SHALL BE IN ACCORDANCE WITH NEC.



3 E1.0 INTERIOR ELECTRICAL EQUIPMENT
SCALE: 3/8" = 1'-0"



2 E1.0 EXTERIOR SERVICE EQUIPMENT
SCALE: 3/8" = 1'-0"

Revisions

#	Description	Date
1	PERMIT REVISIONS	4/10/25

Drawing Title
POWER MAIN LEVEL

Date
2025.04.16

Mechanical:
Energy Lab
David Majid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

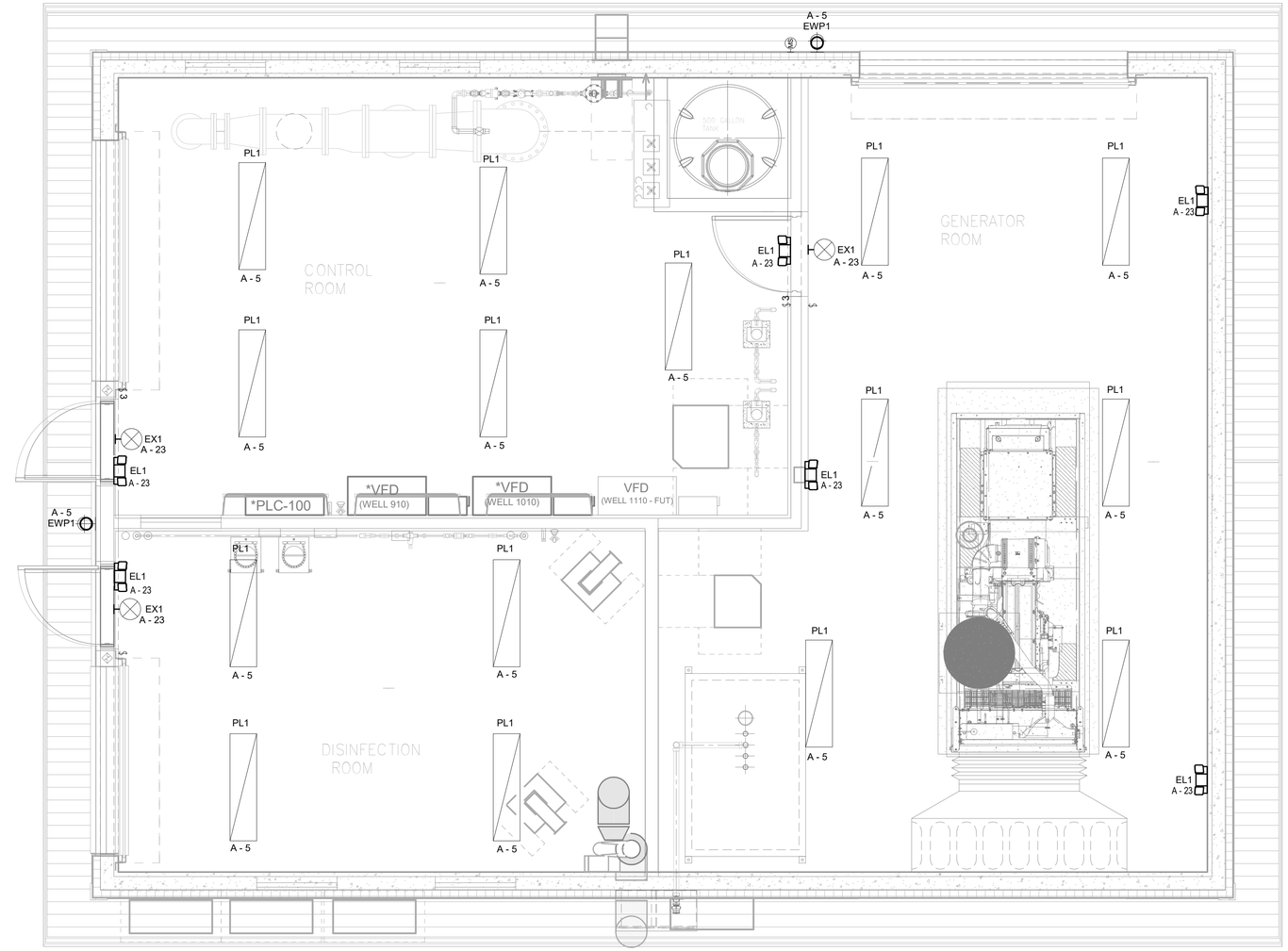
Client:
TOWN OF JACKSON

Project:
TOWN SCHOOL ROAD
PUMP HOUSE

Architect:
Allied ARCHITECTS, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

Professional Engineer
DAVID MAJID
18997
WYOMING

E1.0



1 / E2.0 LIGHTING MAIN LEVEL

SCALE: 3/8" = 1'-0"

GENERAL ELECTRICAL NOTES:

A. IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INVOLVED TO COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, DIFFUSERS, BOXES, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

B. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING OF FLOORS, WALLS, CEILINGS, AND ROOFS TO PERFORM THE REQUIRED WORK DEPICTED IN THESE DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR ALL PATCHING OF HOLES TO THE SATISFACTION OF THE ARCHITECT/ENGINEER.

C. CONTRACTOR IS FULLY RESPONSIBLE FOR FOLLOWING ALL APPLICABLE CODES AND STANDARDS, AS WELL AS ALL LOCAL ADDENDUM TO THOSE CODES AND STANDARDS, WHETHER SPECIFICALLY SHOWN ON THESE DRAWINGS OR NOT.

KEYED NOTES

(#)

LUMINAIRE SCHEDULE

MARK	Manufacturer	Model	Description	LOAD	Initial Color Temperature
EL1	COOPERS LIGHTING	SURE-LITES AP2SQLED30	PROVIDES EMERGENCY LIGHTING FOR A MINIMUM OF 90 MINUTES, ADJUSTABLE HEAD	0 VA	4000 K
EWP1	ACUITY BRANDS LIGHTING	WDGE2 LED-P0-40K-80CRI-T1S-M VOLT-SRM-E20WC-PE	ARCHITECTUAL WALL SCONCE PRECISION REFRACTIVE OPTIC, PROVIDE WITH INTEGRAL PHOTO-CELL	7 VA	4000 K
EX1	COOPERS LIGHTING	SURE-LITES APXRG	LONG LIFE LED LAMPS	2 VA	4000 K
PL1	LSI INDUSTRIES	SDL4-50L-FL-UNV-40-80C RI-EM10	RECESSED DIFFUSED LENS STRIP - INDOOR INDUSTRIAL LED STRIP LIGHT 4' LENGTH, FROSTED LENS	38 VA	4000 K

Professional Engineer
DAVID MAGID
18997
WYOMING

Revisions

#	Description	Date

Drawing Title
LIGHTING MAIN LEVEL

Date
2025.04.16

Mechanical:
Engineer
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Celia Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TOWN HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Alder 45, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

E2.0

GENERAL NOTES

A. CONDUIT, CONDUCTORS AND AIC CALCULATIONS FOR ALL SERVICE, PANEL AND EQUIPMENT FEEDERS INDICATED ON THE ONE-LINE HAVE BEEN SIZED BASED ON COPPER. THE CONTRACTOR MAY USE COMPRESSED ALUMINUM CONDUCTORS FOR THESE FEEDERS PROVIDING THE CONDUIT, CONDUCTOR SIZES AND AIC CALCULATIONS ARE ADJUSTED AS REQUIRED TO MEET ALL NATIONAL ELECTRICAL CODE REQUIREMENTS.

B. INSTALLATION PER UTILTIY REQUIREMENTS

C. COORDINATE EXACT DISTANCES BETWEEN UTILITY TRANSFORMER AND METER/CT WITH LOCAL UTILITY PRIOR TO ROUGH-IN.

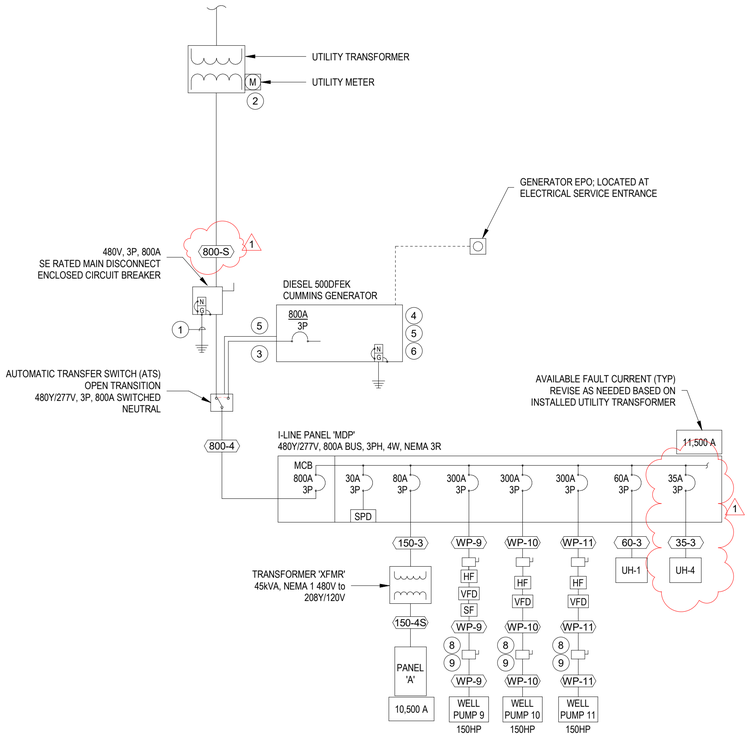
D. BASED ON ACTUAL HOMERUN LENGTHS REQUIRED IN THE FIELD, THE CONTRACTOR IS RESPONSIBLE TO CALCULATE AND INCREASE THE WIRE SIZES AS REQUIRED TO LIMIT BRANCH CIRCUIT VOLTAGE DROP TO 3% OR LESS. FOR 20A BRANCH CIRCUITS THE MINIMUM CONDUCTOR SIZES SHALL BE AS FOLLOWS: #10 AMG CU FOR RUNS BETWEEN 100 AND 200 LINEAR FEET, #8 AWG CU FOR RUNS BETWEEN 200 AND 325 LINEAR FEET, AND AS CALCULATED BY THE CONTRACTOR FOR CIRCUITS EXTENDING BEYOND 325 LINEAR FEET. IN ALL CASES WHERE WIRE SIZES INCREASE, THE CONTRACTOR SHALL PROVIDE LARGER CONDUITS AS REQUIRED.

E. AVAILABLE FAULT CURRENT (AFC) VALUES SHOWN ON THIS DRAWING ARE DESIGN ESTIMATES ONLY. CONTRACTOR MAY SOLICIT THE SERVICES OF EITHER THE ELECTRICAL EQUIPMENT VENDOR, OR AN ENGINEER APPROVED 3RD PARTY, TO PERFORM THE CODE REQUIRED FINAL SHORT CIRCUIT, FAULT CURRENT, STUDIES WHICH ARE TO BE BASED ON CONTRACTOR PROVIDED INFORMATION OF WIRE LENGTHS AND MATERIAL. CONTRACTOR SHALL USE THIS STUDY FOR THE PURCHASE OF EQUIPMENT, AND SHALL SUBMIT THE STUDY RESULTS WITH THE ELECTRICAL EQUIPMENT SUBMITTAL FOR ENGINEERING REVIEW AND APPROVAL. THIS STUDY IS FOR COMPLIANCE WITH NEC 408.6.

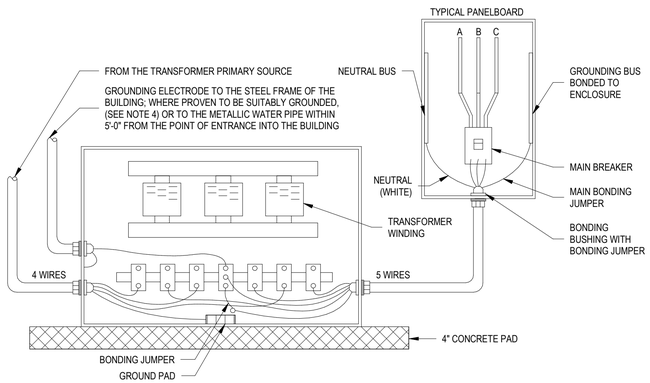
KEYED NOTES

(#)

1. REFER TO DETAIL #2 ON THIS SHEET (E2.0) FOR GROUNDING REQUIREMENTS.
2. CONFIRM ALL REQUIREMENTS WITH LOCAL ELECTRICAL UTILITY FOR TRANSFORMER PADS, CONDUITS, AND INSTALL LOCATIONS PRIOR TO START OF WORK.
3. PROVIDE 'ATS' WITH SOLID NEUTRAL OPEN TRANSITION.
4. COORDINATE GENERATOR EPO LOCATION WITH AHJ.
5. PROVIDE AND TERMINATE ALL NECESSARY WIRING FOR CONTROLS AND COMMUNICATION BETWEEN GENERATOR AND ATS IN SEPERATE CONDUIT. COORDINATE WITH GENERATOR/ATS VENDOR.
6. REFER TO GENERATOR PAD DETAIL #3 ON SHEET E2.0 FOR GROUNDING.
7. PROVIDE POWER FOR GENERATOR BATTERY CHARGER AND BLOCK HEATER.
8. DISCONNECT TO BE PROVIDED WITH BREAK CABLE CONTACTS.
9. ALL WIRING TO THE MOTORS TO BE SHIELDED VFD AND TWISTED CABLES.



1 E3.0 ELECTRICAL ONE-LINE DIAGRAM
SCALE: NTS



GENERAL NOTES

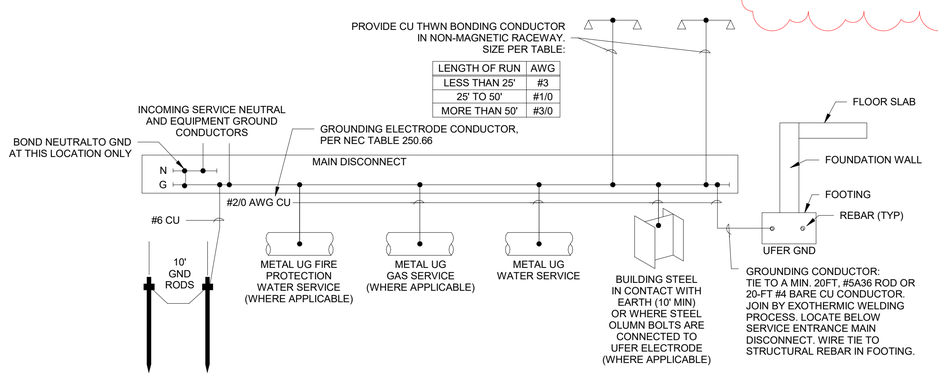
1. TRANSFORMER BONDING STRAP. IF NOT PROVIDED BY THE TRANSFORMER MANUFACTURER THIS STRAP SHOULD BE THE SAME SIZE AS THE MAIN BONDING JUMPER.
2. USE A BONDING BUSHING AND JUMPER AT THE CONDUIT TERMINATION. JUMPER SHOULD BE THE SAME SIZE AS THE GROUNDING ELECTRODE CONDUCTOR CONTAINED IN THE CONDUIT.
3. USE A BONDING CLAMP AT THE TERMINATION OF THE GROUNDING ELECTRODE CONDUCTOR TO THE ELECTRODE.
4. SEE NEC 250.52(A)(2) FOR DEFINITION OF WHERE BUILDING STEEL IS SUITABLE TO SERVE AS A GROUNDING ELECTRODE. PROVIDE NECESSARY BONDS FROM STEEL ANCHOR BOLTS TO ENCASED ELECTRODE.

4 E3.0 TRANSFORMER CONNECTION DETAIL
SCALE: NTS

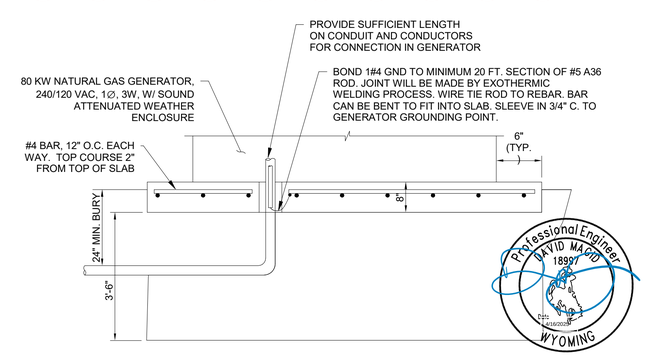
3-PHASE FEEDER SCHEDULE

AMPS-WIRE QTY PER CONDUIT	75 DEG COPPER						75 DEG ALUMINUM					
	SETS IN PARALLEL	CONDUIT	POLE QTY AND AWG	NEUTRAL AWG	GROUND AWG (*2)	SBJ	SETS IN PARALLEL	CONDUIT	POLE QTY AND AWG	NEUTRAL AWG	GROUND AWG (*2)	SBJ
20-4	1	3/4"	3#12	1#12	1#12	1#8	-	-	-	-	-	-
30-3	1	3/4"	3#10	-	1#10	1#8	-	-	-	-	-	-
30-4	1	3/4"	3#10	1#10	1#10	1#8	-	-	-	-	-	-
50-3	1	1"	3#8	-	1#10	1#8	-	-	-	-	-	-
50-4	1	1"	3#8	1#8	1#10	1#8	-	-	-	-	-	-
60-3	1	1-1/4"	3#6	-	1#10	1#8	-	-	-	-	-	-
60-4	1	1-1/4"	3#6	1#6	1#10	1#8	-	-	-	-	-	-
70-3	1	1-1/4"	3#4	-	1#8	1#8	-	-	-	-	-	-
70-4	1	1-1/4"	3#4	1#4	1#8	1#8	-	-	-	-	-	-
90-3	1	1-1/4"	3#3	-	1#8	1#8	-	-	-	-	-	-
90-4	1	1-1/4"	3#3	1#3	1#8	1#8	-	-	-	-	-	-
100-3	1	1-1/4"	3#2	-	1#8	1#6	1	1-1/2"	3#1	-	1#6	1#6
100-4	1	1-1/2"	3#2	1#2	1#8	1#6	1	1-1/2"	3#1	1#1	1#6	1#6
125-3	1	1-1/2"	3#1	-	1#6	1#6	1	2"	3#2/0	-	1#4	1#4
125-4	1	1-1/2"	3#1	1#1	1#6	1#6	1	2"	3#2/0	1#2/0	1#4	1#4
150-3	1	2"	3#1/0	-	1#6	1#6	1	2-1/2"	3#3/0	-	1#4	1#4
150-4	1	2"	3#1/0	1#1/0	1#6	1#6	1	2-1/2"	3#3/0	1#3/0	1#4	1#4
150-4S	1	2"	3#1/0	1#1/0	1#6	1#6	1	2-1/2"	3#3/0	1#3/0	1#4	1#4
175-3	1	2"	3#2/0	-	1#6	1#4	1	2"	3#4/0	-	1#4	1#2
175-4	1	2"	3#2/0	1#2/0	1#6	1#4	1	2-1/2"	3#4/0	1#4/0	1#4	1#2
200-3	1	2"	3#3/0	-	1#6	1#4	1	2-1/2"	3#250	-	1#4	1#2
200-4	1	2-1/2"	3#3/0	1#3/0	1#6	1#4	1	3"	3#250	1#250	1#4	1#2
200-4S	1	2-1/2"	3#3/0	1#3/0	1#6	1#4	1	3"	3#250	1#250	1#4	1#2
225-3	1	2-1/2"	3#4/0	-	1#4	1#2	1	2-1/2"	3#300	-	1#2	1#1/0
225-4	1	2-1/2"	3#4/0	1#4/0	1#4	1#2	1	3"	3#300	1#300	1#2	1#1/0
250-3	1	2-1/2"	3#250	-	1#4	1#2	1	3"	3#350	-	1#2	1#1/0
250-4	1	2-1/2"	3#250	1#250	1#4	1#2	1	3"	3#350	1#350	1#2	1#1/0
300-3	1	3"	3#350	-	1#3	1#2	1	3"	3#500	-	1#2	1#1/0
300-4	1	3"	3#350	1#350	1#3	1#2	1	4"	3#500	1#500	1#2	1#1/0
WP-9	3	4"	3#350	2#8	1#2	1#2	2	4"	3#250	3#250	1#2	1#1/0
WP-10	1	3"	3#250	2#14	1#3	1#3	2	3"	3#350	3#350	1#2	1#1/0
WP-11	1	4"	3#350	2#12	1#2	1#2	2	4"	3#500	3#500	1#2	1#1/0
400-3	2	2"	3#3/0	-	1#3	1#1/0	2	2-1/2"	3#250	-	1#1	1#3/0
400-4	2	2-1/2"	3#3/0	1#3/0	1#3	1#1/0	2	2-1/2"	3#250	1#250	1#1	1#3/0
500-3	2	3"	3#250	-	1#2	1#1/0	2	3"	3#350	-	1#1/0	1#3/0
500-4	2	3"	3#250	1#250	1#2	1#1/0	2	3"	3#350	1#350	1#1/0	1#3/0
600-3	2	3"	3#350	-	1#1/0	1#2/0	2	3"	3#500	-	1#2/0	1#4/0
600-4	2	3"	3#350	1#350	1#1/0	1#2/0	2	4"	3#500	1#500	1#2/0	1#4/0
800-3	3	3"	3#300	-	1#1/0	1#3/0	3	3"	3#400	-	1#3/0	1#4/0
800-S	3	3"	3#300	1#300	-	1#3/0	3	3"	3#400	1#400	-	1#4/0
800-4	3	3"	3#300	1#300	1#1/0	1#3/0	3	4"	3#400	1#400	1#3/0	1#4/0
1000-3	3	3-1/2"	3#400	-	1#2/0	1#3/0	4	3"	3#350	-	1#4/0	1#4/0
1000-4	3	3-1/2"	3#400	1#400	1#2/0	1#3/0	4	3"	3#350	1#350	1#4/0	1#4/0
1200-3	4	3"	3#350	-	1#3/0	1#3/0	4	4"	3#500	-	1#250	1#250
1200-4	4	3"	3#350	1#350	1#3/0	1#3/0	4	4"	3#500	1#500	1#250	1#250
1600-4	5	4"	3#400	1#400	1#4/0	1#250	6	4"	3#400	1#400	1#350	1#300
2000-4	6	4"	3#400	1#400	1#250	1#300	7	4"	3#500	1#500	1#400	1#500
2600-4	7	4"	3#500	1#500	1#350	1#500	7	4"	3#750	1#750	1#600	1#750
3000-4	8	4"	3#500	1#500	1#400	1#500	8	4"	3#750	1#750	1#600	1#750
4100-4	11	4"	3#500	1#500	1#500	1#500	11	4"	3#750	1#750	1#800	1#750

FEEDER SCHEDULE NOTES:
1. CONDUCTORS SHOWN ARE SHOWN FOR EACH CONDUIT WITH MODIFICATIONS AS NOTED BELOW. ALL CONDUCTORS SHOWN ARE THWN UNLESS NOTED OTHERWISE.
2. MODIFY GROUNDING CONDUCTOR PROVIDED PER THE FOLLOWING:
   2A. PROVIDE EQUIPMENT GROUND CONDUCTOR PER TABLE 250-122 WHEN CIRCUIT BREAKER IS SIZED GREATER THAN AMPERE RATING SHOWN IN FEEDER TAG.
   2B. GROUNDING CONDUCTOR SHALL BE OMITTED BETWEEN THE UTILITY TRANSFORMER AND THE FIRST OVERCURRENT PROTECTION DEVICES WHERE GROUNDING IS DERIVED.
   2C. WHERE FEEDER TAG INCLUDES "FC", PROVIDE GROUNDING CONDUCTOR TO MATCH RESPECTIVE PHASE CONDUCTOR SIZE.
   2D. ON FEEDERS FROM THE SECONDARY SIDE OF A TRANSFORMER OR FEEDER TAGGED "SBJ", PROVIDE GROUND CONDUCTOR FROM SBJ COLUMN IN PLACE OF DEFAULT GROUND AWG.
3. PROVIDE A #10 OR SUPER NEUTRAL FOR 15A AND 20A BRANCH CIRCUITS SERVING MULTIPLE KNOWN COMPUTER LOADS. THESE INCLUDE BUT ARE NOT LIMITED TO DEVICES SERVING WORKSTATIONS, POS STATIONS, CUBICAL SYSTEMS FURNITURE, AND DESKS.
4. INFORMATION IN FEEDER SCHEDULE IS ASSOCIATED AND SIZED PER AMPERAGE REFERENCED IN FEEDER TAG. ALTERNATIVE CABLING NOT REQUIRED TO BE INSTALLED IN CONDUIT UNDER THE NEC OF EQUAL OR GREATER AMPERAGE RATING MAY BE INSTALLED WHERE PERMITTED BY LOCAL BUILDING CODES.



2 E3.0 GROUNDING AND BONDING RISER DIAGRAM
SCALE: NTS



3 E3.0 GENERATOR PAD DETAIL
SCALE: NTS

Revisions

#	Description	Date
1	PERMIT REVISIONS	4/10/25

Drawing Title
ONE LINE DIAGRAM

Date
2025.04.16

Mechanical:
Engineering
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TOWN SCHOOL ROAD
PUMP HOUSE

Architect:
Allied 3, LLC.
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

E3.0

Branch Panel: MDP

Location: BUILDING EXTERIOR
Supply From: UTILITY TRANSFORMER
Mounting: SURFACE
Enclosure: NEMA 3R

Volts: 480/277 Wye
Phases: 3
Wires: 4

Available Fault Current: SEE ONE-LINE DIAGRAM
Mains Type: MCB
Mains Rating: 800.0 A
MCB Rating: 800.0 A

CKT	Circuit Description	Breaker Type	Trip	Poles	A		B		C		Poles	Trip	Breaker Type	Circuit Description	CKT
1					0 VA	1233...									2
3	SPD		30.0 A	3			0 VA	1207...			3	80.0 A		XFMR	4
5									0 VA	1076...					6
7					3600...	3600...									8
9	WELL 9		300.0 A	3			3600...	3600...			3	300.0 A		WELL 10	10
11									3600...	3600...					12
13					3600...	1300...									14
15	WELL 11		300.0 A	3			3600...	1300...			3	60.0 A		UNIT HEATER (UH-1) - DISINFECTION RM	16
17									3600...	1300...					18
19					6667...	0 VA									20
21	UNIT HEATER (UH-4) - DISENFECTION RM		35.0 A	3			6667...	0 VA			3	20.0 A	--	SPARE	22
23									6667...	0 VA					24
				Total Load:	139996 VA		139738 VA		138426 VA						
				Total Amps:	506.1 A		505.2 A		499.7 A						

1

Breaker Type Legend:
1 - Arc Fault Circuit Interrupter
2 - Ground Fault Circuit Interrupter
3 - Combination Arc/Ground Fault Circuit Interrupter
4 - Equipment Protective Device
5 - Lockable Breaker
Blank - Standard Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Power	0 VA	0.00%	0 VA		
Lighting	590 VA	100.00%	590 VA	**Total Conn. Load:**	418160 VA
Receptacle	3780 VA	100.00%	3780 VA	**Total Est. Demand:**	365259 VA
Pumps and Controls	324500 VA	100.00%	324500 VA	**Total Conn.:**	503.0 A
Electrical Heat	88168 VA	40.00%	35267 VA	**Total Est. Demand:**	439.3 A
Mech Fans	1122 VA	100.00%	1122 VA		

Notes:
Contractor shall provide arc-fault protection per NEC 210.12 and GFI protection per NEC 210.8 with either a breaker or device rated to provide such protection, whether shown on these drawings or not.

Branch Panel: A

Location: GENERATOR ROOM
Supply From: XFMR
Mounting: SURFACE
Enclosure: NEMA 1

Volts: 120/208 Wye
Phases: 3
Wires: 4

Available Fault Current: SEE ONE-LINE DIAGRAM
Mains Type: MLO
Mains Rating: 200.0 A
MCB Rating: 150.0 A

CKT	Circuit Description	Breaker Type	Trip	Poles	A		B		C		Poles	Trip	Breaker Type	Circuit Description	CKT
1	DISINFECTION RM - RCPTS		20.0 A	1	1260...	900 VA					1	20.0 A		CONTROL RM - RCPTS	2
3	GENERATOR RM - RCPTS		20.0 A	1			900 VA	720 VA			1	20.0 A		GENERATOR RM - RCPTS	4
5	LIGHTING		20.0 A	1					584 VA	2028...	2	20.0 A		CONDENOR UNIT (AC-1) - EXTERIOR	6
7	CONDENOR UNIT (AC-2) - EXTERIOR		20.0 A	2	2028...	2028...									8
9							2028...	2028...			2	20.0 A	2	CONDENOR UNIT (AC-3) - EXTERIOR	10
11	EXHAUST FAN (EF-2) - CONTROL RM		20.0 A	2					219 VA	2028...					12
13					219 VA	228 VA									14
15	UNIT HEATER (UH-3) - GENERATOR RM		25.0 A	3			2000...	228 VA			3	20.0 A		EXHAUST FAN (EF-1) - CONTROL RM	16
17									2000...	228 VA					18
19					2000...	3667...									20
21	SUMP PUMP DISCONNECT		20.0 A	1			500 VA	3667...			3	40.0 A		UNIT HEATER (UH-2) - CONTROL RM	22
23	EMERGENCY LIGHTING		20.0 A	1					6 VA	3667...					24
25	SPARE	--	20.0 A	1	0 VA	0 VA					1	20.0 A	--	SPARE	26
27	SPARE	--	20.0 A	1			0 VA	0 VA			1	20.0 A	--	SPARE	28
29	SPARE	--	20.0 A	1					0 VA	0 VA	1	20.0 A	--	SPARE	30
31	SPARE	--	20.0 A	1	0 VA	0 VA					1	20.0 A	--	SPARE	32
33	SPARE	--	20.0 A	1			0 VA	--			1	--	--	SPACE	34
35	SPACE	--	--	1					--	--	1	--	--	SPACE	36
37	SPACE	--	--	1	--	--					1	--	--	SPACE	38
39	SPACE	--	--	1			--	--			1	--	--	SPACE	40
41	SPACE	--	--	1					--	--	1	--	--	SPACE	42
				Total Load:	12330 VA		12071 VA		10760 VA						
				Total Amps:	104.4 A		102.3 A		89.7 A						

Breaker Type Legend:
1 - Arc Fault Circuit Interrupter
2 - Ground Fault Circuit Interrupter
3 - Combination Arc/Ground Fault Circuit Interrupter
4 - Equipment Protective Device
5 - Lockable Breaker
Blank - Standard Breaker

Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals	
Lighting	590 VA	100.00%	590 VA		
Receptacle	3780 VA	100.00%	3780 VA	**Total Conn. Load:**	35160 VA
Pumps and Controls	500 VA	100.00%	500 VA	**Total Est. Demand:**	17659 VA
Electrical Heat	29168 VA	40.00%	11667 VA	**Total Conn.:**	97.6 A
Mech Fans	1122 VA	100.00%	1122 VA	**Total Est. Demand:**	49.0 A

Notes:
Contractor shall provide arc-fault protection per NEC 210.12 and GFI protection per NEC 210.8 with either a breaker or device rated to provide such protection, whether shown on these drawings or not.

Professional Engineer
DAVID MAGID
18997
WYOMING

Revisions

#	Description	Date
1	PERMIT REVISIONS	4/10/25

Drawing Title
PANEL SCHEDULES

Date
2025.04.16

Mechanical:
Eastern Ave
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TVJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Alpine 4 LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

IRRIGATION SCHEDULE

SYMBOL	MANUFACTURER	MODEL NO.	DESCRIPTION	DETAIL NO.
	RAIN BIRD	1812 SAM PRS WITH MATCHED PRECIPITATION RATE SERIES NOZZLE	HI-POP SPRAY HEAD	11
	RAIN BIRD	1812 SAM-PRS WITH SST, CORNER NOZZLE	HI-POP SPRAY HEAD	11
	RAIN BIRD	44-LRC	QUICK COUPLING VALVE	4
A	RAIN BIRD	ESP-LXME WITH LXMM - 12 STATION MODEL	ELECTRIC CONTROLLER	6
W	RAIN BIRD	WR2-RFC	WEATHER SENSOR DEVICE	7
N/S	OLDCASTLE / CARSON	REFER TO SPECIFICATIONS AND DETAILS	VALVE BOXES	VARIOUS
N/S	AY MACDONALD	76001 - 1/4 TURN - 1"	MANUAL DRAIN VALVE	5
		LINE SIZE - 2½" AND SMALLER	GATE VALVE	3
FS	CST	FSI-T10-001 1"	FLOW SENSOR	2
	RAIN BIRD	PESB	MASTER CONTROL VALVE	1
	RAIN BIRD	PESB WITH NIBCO BALL VALVE	ELECTRIC CONTROL VALVE	10
	RAIN BIRD	XCZ-100-PRB-COM	DRIP VALVE ASSEMBLY	12
		CLASS 200 BE - 2½" & SMALLER	PVC MAINLINE	8
		CLASS 200 BE	PVC LATERAL	8
		DR-11	HDPE SLEEVING	9
	TORO	BLUE STRIPE	POLY DRIP TUBING -¾" MIN. WIDTH	12 - 14
N/S	RAIN BIRD	XBCV - XERI-BUG WITH CHECK VALVE	DRIP EMITTERS	13
	HUNTER / NIBCO	ECO-ID-12 WITH NIBCO BALL VALVE	DRIP LINE BLOW-OUT STUB AND INDICATOR HEAD	14
1 / 1"			CONTROLLER # STATION NO. / CONTROL VALVE SIZE	
A (controller)			NUMBER OF SPARE WIRES - 2 CONTROL AND 1 SPARE WIRES TO INDICATED CONTROLLER - SEE CONSTRUCTION NOTES	

IRRIGATION CONSTRUCTION NOTES

1. DRAWINGS AND BASE INFORMATION - ALL BASE AND PLANTING INFORMATION HAVE BEEN PROVIDED BY ROOTED LANDSCAPE ARCHITECTURE. THE CONTRACTOR IS RESPONSIBLE TO NOTIFY HYDROSYSTEMS*KDI OF ANY DISCREPANCIES BETWEEN THE UTILITY OR PLANTING PLANS AND THE IRRIGATION PLAN. IF CONTRACTOR FAILS TO NOTIFY HYDROSYSTEMS*KDI AND MAKES CHANGES TO THE IRRIGATION SYSTEM DESIGN, THEY ASSUME ALL COSTS AND LIABILITIES ASSOCIATED WITH THOSE FIELD CHANGES. REFER TO SPECIFICATIONS FOR ADDITIONAL PROJECT REQUIREMENTS. CONTACT IRRIGATION CONSULTANT FOR CURRENT SPECIFICATIONS IF NOT PROVIDED.

2. SYSTEM PRESSURE - HYDROSYSTEMS*KDI HAS CONTACTED THE PLUMBING ENGINEER THAT DESIGNED THIS SITE AND THEY HAVE BEEN TOLD THAT THE STATIC WATER PRESSURE IN THIS AREA SHOULD BE 90 PSI. THE CONTRACTOR IS RESPONSIBLE TO FIELD VERIFY PRESSURE PRIOR TO COMMENCING ANY CONSTRUCTION AND NOTIFY HYDROSYSTEMS*KDI OF ANY VARIANCE FROM THE STATED PRESSURE IMMEDIATELY. WRITTEN DOCUMENTATION OF PRESSURE TEST AND RESULTS SHALL BE PROVIDED TO HYDROSYSTEMS*KDI AT CONSTRUCTION ONSET. IF CONTRACTOR FAILS TO FIELD VERIFY PRESSURE AND/OR NOTIFY HYDROSYSTEMS*KDI OR ANY VARIATIONS FROM THIS PRESSURE, THEN THEY ASSUME ALL CONSTRUCTION AND ENGINEERING COSTS ASSOCIATED WITH SYSTEM MODIFICATIONS REQUIRED TO ACCOMMODATE ACTUAL SITE PRESSURE. THIS SYSTEM HAS BEEN DESIGNED FOR A REQUIRED STATIC PRESSURE OF 60 PSI MINIMUM.

3. IRRIGATION SYSTEM OPERATION INTENT - THIS IRRIGATION SYSTEM HAS BEEN DESIGNED TO IRRIGATE THE ESTABLISHED LANDSCAPE WITHIN A THREE NIGHT PER WEEK, SIX HOUR PER NIGHT WATERING WINDOW. ESTABLISHMENT WATERING WILL REQUIRE UP TO TWICE AS MUCH IRRIGATION FOR A FOUR TO SIX WEEK PERIOD. THE DESIGN IS BASED ON THE FOLLOWING PROJECTED WEEKLY APPLICATION RATES AFTER ESTABLISHMENT. THESE FIGURES ARE BASED ON A 30-YEAR AVERAGE WEATHER DATA AND WILL NEED TO BE ADJUSTED DUE TO SEASONAL CHANGES AND WEATHER CONDITIONS ABOVE AND BELOW THE AVERAGE VALUES UTILIZED.

ORNAMENTAL PLANTINGS	0.78" PER WEEK PEAK SEASON
NATIVE SEED MIXES	0.65" PER WEEK PEAK SEASON (TWO SEASONS)

NOTE: IT IS THE INTENT OF THIS DESIGN THAT NATIVE AREAS WOULD ONLY BE IRRIGATED FOR ESTABLISHMENT. SYSTEM WILL REMAIN FOR USE DURING YEARS WITH LESS THAN NORMAL RAINFALL.

6. EQUIPMENT INSTALLATION - IT IS THE INTENT OF THIS DESIGN THAT ALL IRRIGATION EQUIPMENT BE INSTALLED WITHIN PROPERTY LIMITS AND WITHIN LANDSCAPED AREAS. INSTALLATION SHALL BE COORDINATED WITH OTHER UTILITY WORK, ALL OTHER UTILITIES SHALL TAKE PRECEDENCE OVER IRRIGATION LOCATION. LANDSCAPE TREES, SHRUBS AND OTHER PERMANENT ELEMENTS SHALL BE AVOIDED WHEN PLACING IRRIGATION BOXES AND PRESSURIZED MAINLINE, REFER TO LANDSCAPE PLANS. FLAG LOCATIONS FOR LANDSCAPE ARCHITECT REVIEW WHERE CONFLICTS MAY OCCUR IN FIELD. ANY EQUIPMENT OTHER THAN VALVE BOXES OR SLEEVING THAT CONTAINS PIPE OR WIRES SHOWN OUTSIDE OF THESE LIMITS IS SHOWN IN THAT LOCATION FOR GRAPHICAL CLARITY ONLY. ALL VALVE BOXES SHALL BE INSTALLED A MINIMUM OF 2'-0" FROM EDGE OF ANY PAVED SURFACES UNLESS SPECIFICALLY INDICATED ON PLANS. BOXES INSTALLED IN OPEN TURF AREAS SHALL BE KEPT TO EDGES AND STAKED FOR REVIEW IF ALONG HIGH TRAFFIC AREAS. ALL VALVE BOXES SHALL BE PLACED A MINIMUM OF 3'-0" FROM THE CENTERLINE OF ANY DRAINAGE SWALE. ALL VALVE BOXES WITHIN PAVEMENT SHALL BE TIER 15 RATED BOXES FOR HEAVY DUTY NON-DELIBERATE TRAFFIC. BOX LID COLOR SHALL MATCH ADJACENT MATERIALS, I.E. GREEN IN TURF, TAN IN WOOD MULCH, GRAY IN STONE MULCH, PURPLE FOR RECLAIMED WATER SYSTEMS (IF REQUIRED). REFER TO LANDSCAPE PLANS FOR MATERIAL COLORS AND TYPES. ALL BOXES SHALL BE INSTALLED TO BE FLUSH WITH GRADE AND IN AN ORDERLY MANNER. WHERE MORTAR PAVING LIDS ARE INSTALLED ABOVE BOXES, IRRIGATION BOX WITH LID SHALL BE LOWERED TO ACCOMMODATE PAVING LID. REFER TO LANDSCAPE FOR ADDITIONAL INFORMATION, TO BE INSTALLED PER MANUFACTURE RECOMMENDATIONS.

7. PIPING INSTALLATION - IRRIGATION PIPING SHALL MAINTAIN A MINIMUM DISTANCE FROM BUILDING FOUNDATIONS OF 5 FEET OR AS DESCRIBED IN SOILS REPORT, WHICHEVER IS GREATER. NO SPRAY IRRIGATION SHALL OCCUR WITHIN 10 FEET OF THE FOUNDATION. NO DRIP IRRIGATION SHALL OCCUR WITHIN 5 FEET OF THE FOUNDATION UNLESS SOIL MOISTURE SENSORS ARE INSTALLED ON VALVES SERVICING THESE AREAS. ALL IRRIGATION PIPING AND EMISSION DEVICES LOCATED ON TOP OF OR WITHIN BUILDING STRUCTURE SHALL CONFORM TO WATERPROOFING CONSULTANT REQUIREMENTS. PIPE ROUTING MAY BE SHOWN WITHIN THESE DISTANCES FOR GRAPHICAL CLARITY ONLY.

8. MANUAL DRAIN VALVES - CONTRACTOR TO INSTALL ONE MANUAL DRAIN VALVE ON PRESSURE SUPPLY LINE DIRECTLY DOWNSTREAM OF BACKFLOW PREVENTER AND AT ALL LOW POINTS AND DEAD ENDS OF PRESSURE SUPPLY PIPING TO ENSURE COMPLETE DRAINAGE OF SYSTEM. CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THESE LOCATIONS IN-FIELD AND INSTALLATION LOCATIONS SHALL BE NOTED ON AS-BUILTS.

9. POP-UP SPRAY NOZZLES - CONTRACTOR TO INSTALL PLASTIC NOZZLES ON ALL POP-UP SPRAY HEADS. INSTALL 15 SERIES NOZZLES ON ALL HEADS SPACED AT 12' TO 14'. INSTALL 12 SERIES NOZZLES ON ALL HEADS SPACED 10' TO 11'. INSTALL 10 SERIES NOZZLES ON ALL HEADS SPACED AT 8' TO 9'. INSTALL 8 SERIES NOZZLES ON ALL HEADS SPACED AT 6' TO 7'. INSTALL 5' NOZZLES ON ALL HEADS SPACED AT 5'. INSTALL SIDE STRIP NOZZLES ON ALL HEADS WITH AN "S" DESIGNATION AND RIGHT AND LEFT CORNER STRIP NOZZLES ON ALL HEADS WITH AN "L" OR "R" DESIGNATION. AT SPACING SHOWN. VARIABLE ARC NOZZLES SHOULD BE UTILIZED ADJACENT TO CURVILINEAR SHRUB BEDS OR FOR ANY ANGLES THAT ARE NOT A STANDARD NOZZLE ANGLE.

10. DRIP IRRIGATION - REFER TO IRRIGATION DETAIL SHEET FOR DRIP EMITTER QUANTITIES AND PLACEMENT.

11. UNLABELED PIPING - ALL UNLABELED LATERAL PIPING SHALL BE 1" MINIMUM UNLESS OTHERWISE NOTED.

12. SLEEVING - ALL SLEEVING UNDER PAVED SURFACES SHOWN ON PLANS IS BY CONTRACTOR UNLESS OTHERWISE NOTED. SLEEVING SHALL BE INSTALLED IN THE SIZES AND QUANTITIES SHOWN ON PLANS OR BASED ON THE SCHEDULE BELOW. WHERE SLEEVES ARE SHOWN, BUT NOT LABELED, FOLLOW THE SCHEDULE BELOW. ALL MAINLINE, CONTROL WIRES AND DRIP LINES UNDER PAVED SURFACES ARE TO BE INSTALLED IN SLEEVING. ALL MAINLINE SLEEVE LOCATIONS TO INCLUDE A SEPARATE WIRE SLEEVE.

SLEEVED PIPE SIZE/WIRE QUANTITY	REQUIRED SLEEVE SIZE & (QUANTITY)
¾" - 1¼" PIPING	2" PVC (1)
1½" - 2" PIPING	4" PVC (1)

13. SPARE CONTROL WIRES - CONTRACTOR SHALL EXTEND THREE SPARE WIRES (ONE COMMON AND 2 CONTROL WIRES) FROM EACH CONTROLLER TO THE END OF THE MAINLINE SERVING THAT CONTROLLER OR AS SHOWN ON THE PLANS. INSTALL SPARE WIRES IN 10" ROUND VALVE BOX WITH QUICK COUPLING VALVE. REFER TO SPECIFICATIONS FOR WIRE COLOR. SEE IRRIGATION SCHEDULE FOR ADDITIONAL INFORMATION.

14. ADJUSTMENT - CONTRACTOR SHALL FINE TUNE/ADJUST THE IRRIGATION SYSTEM TO REDUCE/AVOID OVERSPRAY ONTO HARD SURFACES BY ADJUSTING NOZZLE DIRECTION AND NOZZLE RADIUS.

15. PLANS AND SPECIFICATIONS - CONTRACTOR RESPONSIBLE TO ENSURE WORK CONFORMS TO PLANS AND SPECIFICATIONS, INCLUDING ANY REVISED SETS. AT ONSET OF CONSTRUCTION, VERIFY PLANS ARE CURRENT. DO NOT CONSTRUCT ANY PORTIONS OF THE IRRIGATION OFF OF PLANS MARKED NOT FOR CONSTRUCTION OR FOR REVIEW ONLY. FAILURE TO VERIFY CURRENT PLANS MAY RESULT IN RECONSTRUCTION AT CONTRACTOR'S EXPENSE.

16. SIMULTANEOUS ZONE OPERATION - THIS IRRIGATION SYSTEM HAS BEEN DESIGNED TO OPERATE MULTIPLE ZONES SIMULTANEOUSLY BASED ON INDIVIDUAL ZONE FLOW. THE DESIGN IS INTENDED TO OPERATE MULTIPLE VALVES, UP TO THE MAXIMUM FLOW IN THE POINT OF CONNECTION NOTE. REFER TO CONTROLLER SPECIFICATION FOR MAXIMUM SIMULTANEOUS VALVE COUNT.

17. BACKFLOW DEVICES: ALL CONNECTION COMPONENTS AND BACKFLOW DEVICES SHALL BE LEAD-FREE. CONTRACTOR SHALL CONTACT WATER SERVICE PROVIDER FOR ANY ADDITIONAL REQUIREMENTS REGARDING BACKFLOW TESTING.

18. WATER BUDGETS AND PROJECTIONS - HYDROSYSTEMS-KDI HAS BASED THE IRRIGATION DESIGN AND THE ASSOCIATED PROJECTED WATER USE UPON SUCH FACTORS AS CITY OR WATER DISTRICT IMPOSED REQUIREMENTS, PUBLISHED PLANT SPECIES WATER NEEDS, SELECTED IRRIGATION METHOD EFFICIENCIES AS REPORTED BY INDEPENDENT TESTING FACILITIES, HISTORICAL WEATHER DATA FOR THE PROJECT LOCATION, AND PROPER MAINTENANCE PROCEDURES. HYDROSYSTEMS*KDI IS NOT RESPONSIBLE, AND ACCEPTS NO RESPONSIBILITY, FOR THE ACTUAL WATER USAGE VARIATION THAT IS A RESULT OF FIELD MODIFICATIONS TO THE SYSTEM NOT MATCHING CONSTRUCTION DOCUMENTS, IMPROPER MAINTENANCE, WASTE DUE TO SYSTEM DAMAGE OR VANDALISM, OR WEATHER CONDITIONS THAT DEVIATE FROM PUBLISHED 30 YEAR HISTORICAL AVERAGES.

19. PRESSURE TESTING - CONDUCT MAINLINE TEST IN PRESENCE OF CONSULTANT. ARRANGE FOR PRESENCE OF CONSULTANT 48 HOURS IN ADVANCE OF TESTING. SUPPLY FORCE PUMP AND ALL OTHER TEST EQUIPMENT. COMPRESSED AIR SHALL NOT BE USED FOR PRESSURE TESTING SYSTEM.
    - 19.1. AFTER BACKFILLING, AND INSTALLATION OF ALL CONTROL VALVES, FILL PRESSURE SUPPLY LINE WITH WATER, AND PRESSURIZE TO 40 PSI OVER THE DESIGNATED STATIC PRESSURE OR 120 PSI, WHICHEVER IS GREATER, FOR A PERIOD OF 2 HOURS.
    - 19.2. LEAKAGE, PRESSURE LOSS - TEST IS ACCEPTABLE IF NO LOSS OF PRESSURE IS EVIDENT DURING THE TEST PERIOD.
    - 19.3. LEAKS - DETECT AND REPAIR LEAKS.
    - 19.4. RETEST SYSTEM UNTIL TEST PRESSURE CAN BE MAINTAINED FOR DURATION OF TEST.
    - 19.5. BEFORE FINAL ACCEPTANCE, PRESSURE SUPPLY LINE SHALL REMAIN UNDER PRESSURE FOR A PERIOD OF 48 HOURS.
    - 19.6. PRESSURE TEST SHALL BE SCHEDULED AND PASSED PRIOR TO SCHEDULING OF SUBSTANTIAL COMPLETION WALK-THROUGH.

DIRECTORY

IRRIGATION SCHEDULE	IR1.0
IRRIGATION NOTES	IR1.0
IRRIGATION PLANS	IR2.1
IRRIGATION DETAILS	IR3.1 - IR3.2

REVIEW
NOT FOR CONSTRUCTION

811
Know what's below.
Call before you dig.
CALL 3 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

HydroSystems KDI
Irrigation Consulting & Water Management
13949 W. Colfax Ave, Suite 260 Lakewood, Colorado 80401
o: 303.980.5327 www.hydrosystemskdi.com

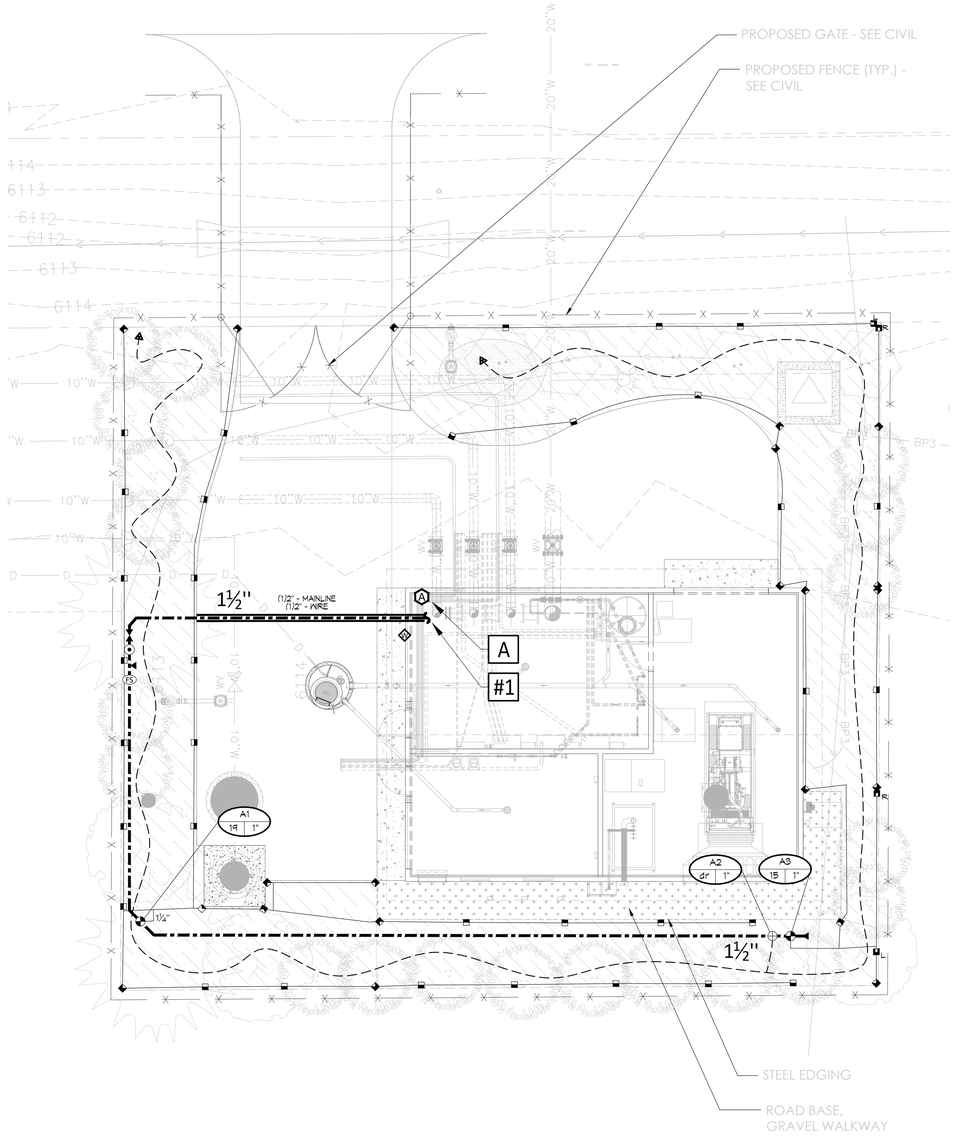
rooted
landscape architecture
51 pine drive
star valley ranch, wy 83127
307.203.5520
www.rooted-la.com

High School Road Pump House
TOWN OF JACKSON

ISSUE	DATE
BID SET	08.20.2025

IRRIGATION NOTES AND SCHEDULE

IR1.0



#1 POINT OF CONNECTION #1 - 1"

PEAK FLOW REQUIREMENT: 20 GPM. REQUIRED STATIC PRESSURE: 90 PSI

TIE ONTO 1" COPPER STUB-OUT AT THIS APPROXIMATE LOCATION. INSTALLATION OF ONE 1" REDUCED PRESSURE BACKFLOW PREVENTER AND PRESSURE REDUCING VALVE AND STUB TO THIS LOCATION (SEE BUILDING PLUMBING, SHEETS P1.0 & P1.1). TRANSITION TO 1.5" HDPE AND EXTEND AS SHOWN ON PLAN (INSTALL (2) HDPE SLEEVES). CONTRACTOR SHALL COORDINATE WITH GENERAL CONTRACTOR TO WATERPROOF SEAL ALL FOUNDATION OR STRUCTURAL SLAB PENETRATION. WHEN PVC MAINLINE EXITS PVC SLEEVE INTO SOFTSCAPE, INSTALL ONE 1.5" GATE VALVE, ONE MANUAL DRAIN VALVE, ONE 1.5" MASTER VALVE, ONE QUICK COUPLER VALVE, AND ONE 1" FLOW SENSOR. EXTEND PVC MAINLINE AS SHOWN. SET PRV AT 75 PSI. EXTEND ONE PE89 SHIELDED CABLE FROM FLOW SENSOR TO DATA RETRIEVAL UNIT LOCATED IN ASSOCIATED CONTROLLER. EXTEND 4 UFUL14# WIRE (TWO ORANGE AND TWO BLUE) AND CONNECT 2 OF THE WIRES FROM THE MASTER VALVE TO THE DATA RETRIEVAL BOARD IN ASSOCIATED CONTROLLER. SEE DETAIL SHEET FOR REQUIRED PIPE LENGTHS UPSTREAM AND DOWNSTREAM OF FLOW SENSING UNIT. NO PVC PIPE SHALL BE VISIBLE ON BUILDING EXTERIOR. WORK SHALL CONFORM TO LOCAL CODE. FEES, PERMITS AND INSPECTIONS ASSOCIATED WITH WORK ARE TO BE OBTAINED AND PAID FOR BY CONTRACTOR.

A CONTROLLER LOCATION "A"

WALL MOUNT ONE IRRIGATION CONTROLLER (REFER TO SCHEDULE FOR MODEL & STATION COUNT), REMOTE READY, AT INDICATED LOCATION. CONTRACTOR TO EXTEND CONTROL WIRING IN CONDUIT TO PVC 2" SLEEVE INDICATED FOR WIRING, EXTEND AS SHOWN. 120 VOLT POWER IS AVAILABLE WITHIN 10 LF. OF CONTROLLER LOCATION AT DESIGNATED WALL RECEPTACLE OUTLET (USE PIGTAIL CONNECTION FROM CONTROLLER TO OUTLET). FEES AND PERMITS ASSOCIATED WITH WORK ARE TO BE OBTAINED AND PAID BY CONTRACTOR. LOCATE SHIELDED CABLE FROM FLOW SENSOR AND CONNECT TO DATA RETRIEVAL UNIT LOCATED IN ASSOCIATED CONTROLLER. LOCATE MASTER VALVE WIRES WITH SPARES AND CONNECT 2 OF THE WIRES FROM THE MASTER VALVE TO THE DATA RETRIEVAL BOARD IN ASSOCIATED CONTROLLER. FINAL CONTROLLER LOCATION SHALL BE APPROVED BY OWNER OR OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION. MOUNT ONE WEATHER SENSOR ON BUILDING WHERE THERE IS 20 FT. OF CLEARANCE FROM ANY OVERHANG OR OBSTRUCTING FEATURE. INSTALL WEATHER SENSOR RECEIVER ON EXTERNAL WALL. FINAL WEATHER SENSOR LOCATION SHALL BE APPROVED BY OWNER OR OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION.

DIRECTORY

IRRIGATION SCHEDULE	IR1.0
IRRIGATION NOTES	IR1.0
IRRIGATION PLANS	IR2.1
IRRIGATION DETAILS	IR3.1 - IR3.2

NORTH

0 4' 8' 16'

SCALE: 1"=8'

REVIEW
NOT FOR CONSTRUCTION

Know what's below.
Call before you dig.
CALL 3 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

rooted
landscape architecture
51 pine drive
star valley ranch, wy 83127
307.203.5520
www.rooted-la.com

High School Road Pump House

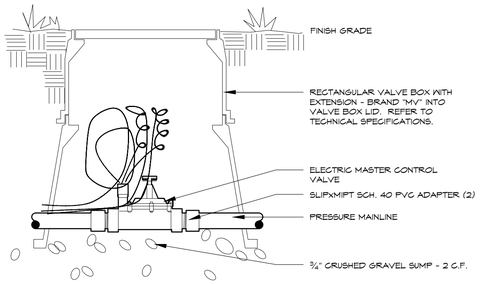
TOWN OF JACKSON

ISSUE	DATE
BID SET	08.20.2025

HydroSystems KDI
Irrigation Consulting & Water Management
13949 W. Colfax Ave, Suite 260 Lakewood, Colorado 80401
o: 303.980.5327 www.hydrosystemskdi.com

IRRIGATION PLAN

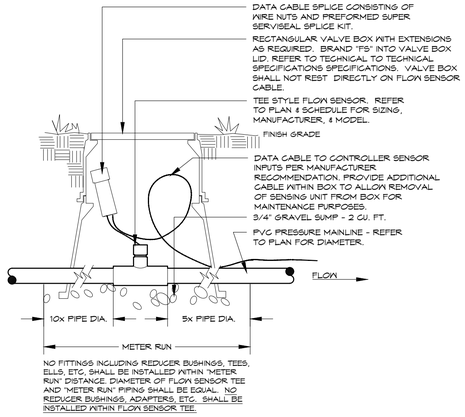
IR2.1



MASTER VALVE

24V - Small - Typical

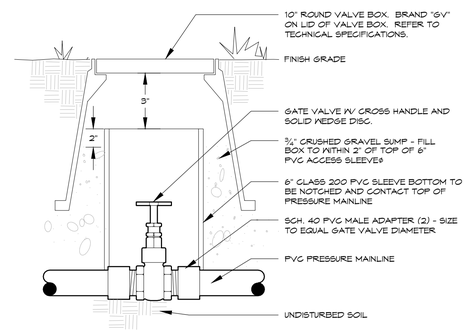
1



FLOW SENSOR

VIA DATA CABLE - TEE STYLE

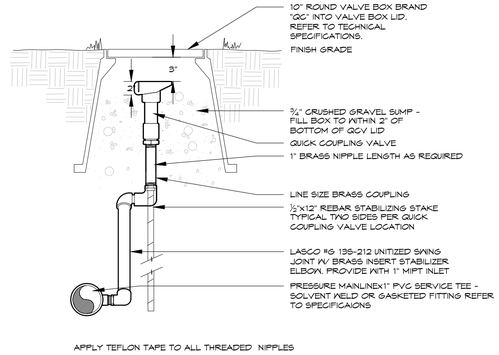
2



GATE VALVE

2.5" & SMALLER - X-HANDLE

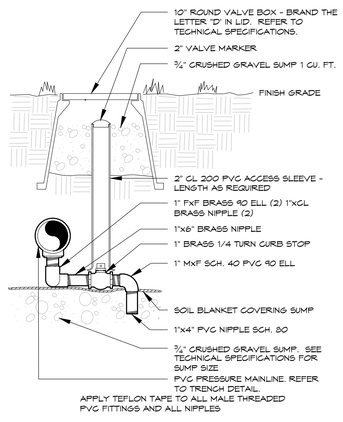
3



QUICK COUPLING VALVE

LASCOSWING - TYPICAL

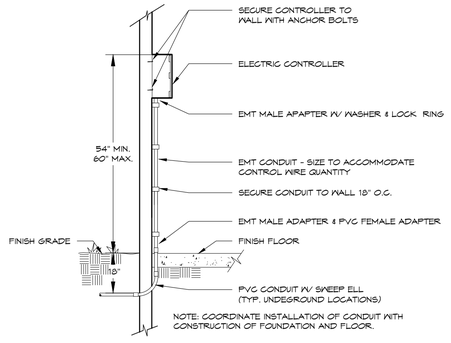
4



MANUAL DRAIN VALVE

TYPICAL

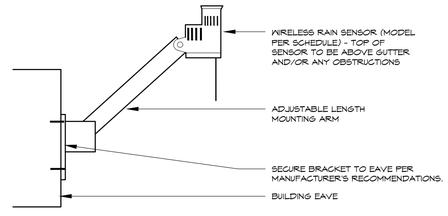
5



ELECTRIC CONTROLLER

INTERIOR WALL MOUNT - FLOOR PENETRATING

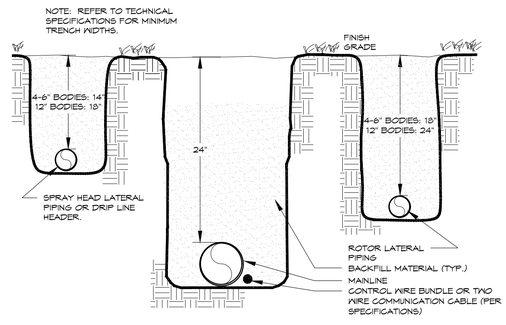
6



WEATHER SENSOR

EAVE MOUNTED - Wireless

7



TRENCH

24" MAINLINE

8

DIRECTORY

IRRIGATION SCHEDULE	IR1.0
IRRIGATION NOTES	IR1.0
IRRIGATION PLANS	IR2.1
IRRIGATION DETAILS	IR3.1 - IR3.2

REVIEW
NOT FOR CONSTRUCTION

811
Know what's below.
Call before you dig.
CALL 3 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

KDI
HydroSystems
Irrigation Consulting & Water Management
13949 W. Colfax Ave, Suite 260 Lakewood, Colorado 80401
o: 303.980.5327 www.hydrosystemskdi.com

rooted
landscape architecture
51 pine drive
star valley ranch, wy 83127
307.203.5520
www.rooted-la.com

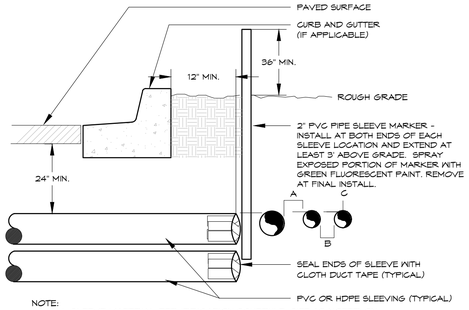
High School Road Pump House

TOWN OF JACKSON

ISSUE	DATE
BID SET	08.20.2025

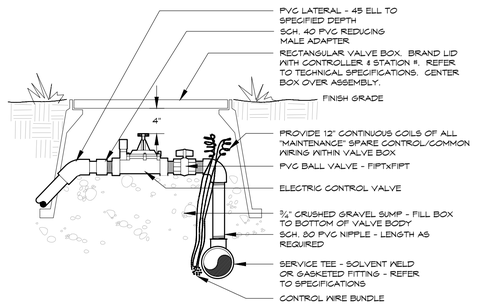
IRRIGATION DETAILS

IR3.1



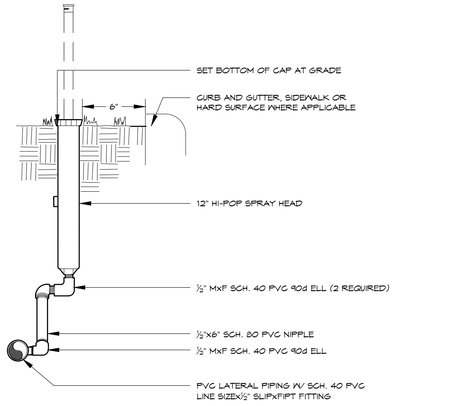
NOTE:
- ALL SLEEVE MATERIAL PER IRRIGATION SCHEDULE, SIZE AS NOTED ON PLAN.
- INSTALL SLEEVES IN SIDE-BY-SIDE CONFIGURATION WHERE MULTIPLE SLEEVES ARE TO BE INSTALLED. SPACE SLEEVES 4" TO 6" APART. DO NOT STACK SLEEVES VERTICALLY.
- CONTRACTOR TO COORDINATE WITH FLATWORK INSTALLER TO BRAND A "V" IN SIDEWALK OR CURB AT BOTH ENDS OF SLEEVE CROSSING.
- SLEEVING THROUGH OR UNDER RETAINING WALLS, PLANTER WALLS, POND LINING, OR WATER QUALITY AREAS SHALL BE COORDINATED WITH CIVIL WORK AT APPROXIMATE LOCATIONS SHOWN.
- AN INDIVIDUAL SLEEVE SHALL CONTAIN NO MORE THAN ONE PIPE OR WIRE BUNDLE.

IRRIGATION SLEEVING
TYPICAL — 9



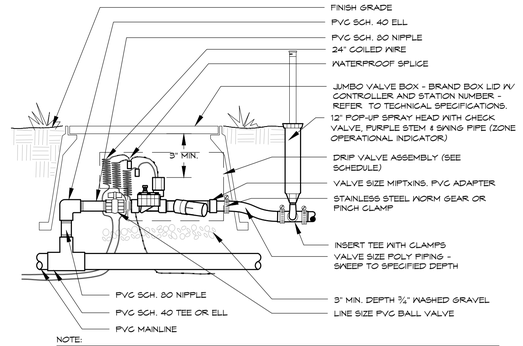
NOTE: DIAMETERS OF BALL VALVES, PVC FITTINGS AND NIPPLES SHALL EQUAL ELECTRIC CONTROL VALVE DIAMETER. VALVE BOXES SHALL BE INSTALLED PARALLEL OR PERPENDICULAR TO ADJACENT SIDEWALKS AND HARD SURFACES WHERE APPLICABLE. APPLY TEFLON TAPE TO ALL MALE THREADED FITTINGS AND THREADED NIPPLES.

ELECTRIC CONTROL VALVE
24V - PVC Lateral — 10



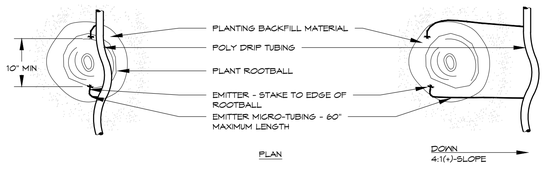
NOTE:
- SET HEAD PERPENDICULAR TO FINISH GRADE SWING.
- JOINT ASSEMBLY SHALL BE ATTACHED TO BOTTOM SPRAY HEAD INLET ONLY.
- APPLY TEFLON TAPE TO ALL MALE PVC THREADED FITTINGS AND NIPPLES.

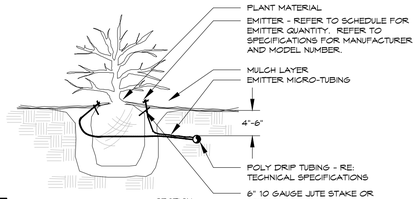
HI-POP SPRAY HEAD
SWING JOINT - PVC — 11



NOTE:
INSTALL ASSEMBLY TO REST ON GRAVEL SUMP. CONTAIN ENTIRE ASSEMBLY WITHIN BOX. NO VALVE BOX EXTENSIONS WILL BE ACCEPTED. PROVIDE 3"-4" CLEARANCE BETWEEN TOP OF CONTROL VALVE SOLENOID AND BOTTOM OF VALVE BOX LID. TOP OF VALVE BOX TO BE FLUSH WITH FINISH GRADE. VALVE BOX SHALL NOT REST ON DRIP TUBING.

DRIP VALVE
24V - POLY LATERAL — 12

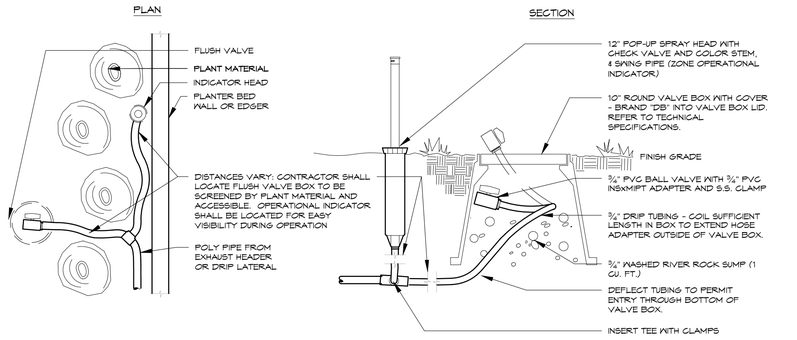




PLANT SIZE	EMITTER FLOW RATE	EMITTER QTY. AT MULCHED BED LOCATIONS	EMITTER QTY. AT NATIVE SEED LOCATIONS
1 - 2 GALLON MATERIAL	0.5 GPH	ONE EACH	ONE EACH
5 GALLON MATERIAL	0.5 GPH	TWO EACH	TWO EACH
1½" CALIPER TREE	1.0 GPH	THREE EACH	FOUR EACH
2" CALIPER TREE	1.0 GPH	FOUR EACH	SIX EACH
2½" CALIPER TREE	1.0 GPH	SIX EACH	EIGHT EACH
3" CALIPER TREE	1.0 GPH	EIGHT EACH	TEN EACH
3½" CALIPER TREE	1.0 GPH	NINE EACH	ELEVEN EACH
4" CALIPER TREE	1.0 GPH	TEN EACH	TWELVE EACH
6 FT. CONIFEROUS TREE	1.0 GPH	FOUR EACH	SIX EACH
8 FT. CONIFEROUS TREE	1.0 GPH	SIX EACH	NINE EACH
10 FT. CONIFEROUS TREE	1.0 GPH	EIGHT EACH	TWELVE EACH
12 FT. CONIFEROUS TREE	1.0 GPH	TEN EACH	FOURTEEN EACH

NOTES:
- INSTALL EMITTERS ON OPPOSING SIDES OF ROOTBALL. THREE OR MORE EMITTERS SHALL BE EQUALLY SPACED AROUND ROOT BALL.
- EMITTERS ARE TO BE INSTALLED TO CLEAR SURFACE BY A MINIMUM OF 1" AND A MAXIMUM OF 2".
- FLUSH ALL LINES THOROUGHLY, INCLUDING EMITTER MICRO-TUBING PRIOR TO EMITTER INSTALLATION.
- IF PLANTING ON A 4:1 SLOPE OR STEEPER, INSTALL BOTH EMITTERS ON UPHILL SIDE OF ROOT BALL.
- EMITTERS SHALL BE SELF-FLUSHING, PRESSURE COMPENSATING-TYPE UNLESS NOTED OTHERWISE WITHIN TECHNICAL SPECIFICATIONS.
- DRIP VALVE ZONES ARE DESIGNED TO ACCOUNT FOR DIFFERENCES IN PLANT REQUIREMENTS (HYDROZONES) AND SUN EXPOSURE.
- CONTRACTOR SHALL ENSURE HYDROZONES ARE VALVED SEPARATELY AS SHOWN ON PLAN.
- SITE CONDITIONS MAY DICTATE THAT MULTIPLE SUN EXPOSURES ARE VALVED TOGETHER DURING THE DESIGN PROCESS. CONTRACTOR SHALL ADJUST EMITTER SCHEDULE AS FOLLOWS:
  - EMITTER QUANTITIES SHALL REMAIN THE SAME BUT EMITTER GALLONAGES SHALL BE DOUBLED FOR PLANTS WITH SOUTH AND WEST EXPOSURES.
  - EMITTER QUANTITIES AND GALLONAGE SHALL BE AS SHOWN IN SCHEDULE FOR PLANTS WITH NORTH AND EAST EXPOSURES.
  - PLANTINGS WITH NORTH AND EAST EXPOSURE SHALL DICTATE VALVE RUN-TIMES AND CONTRACTOR SHALL ADJUST SCHEDULING ACCORDINGLY.

DRIP EMITTER
BELOW GRADE — 13



DRIP FLUSH VALVE
WITH OPERATIONAL INDICATOR — 14

DIRECTORY

IRRIGATION SCHEDULE	IR1.0
IRRIGATION NOTES	IR1.0
IRRIGATION PLANS	IR2.1
IRRIGATION DETAILS	IR3.1 - IR3.2

REVIEW
NOT FOR CONSTRUCTION

811 Know what's below. Call before you dig.
CALL 3 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND MEMBER UTILITIES.

KDI HydroSystems
Irrigation Consulting & Water Management
13949 W. Colfax Ave, Suite 260 Lakewood, Colorado 80401
o: 303.980.5327 www.hydrosystemskdi.com

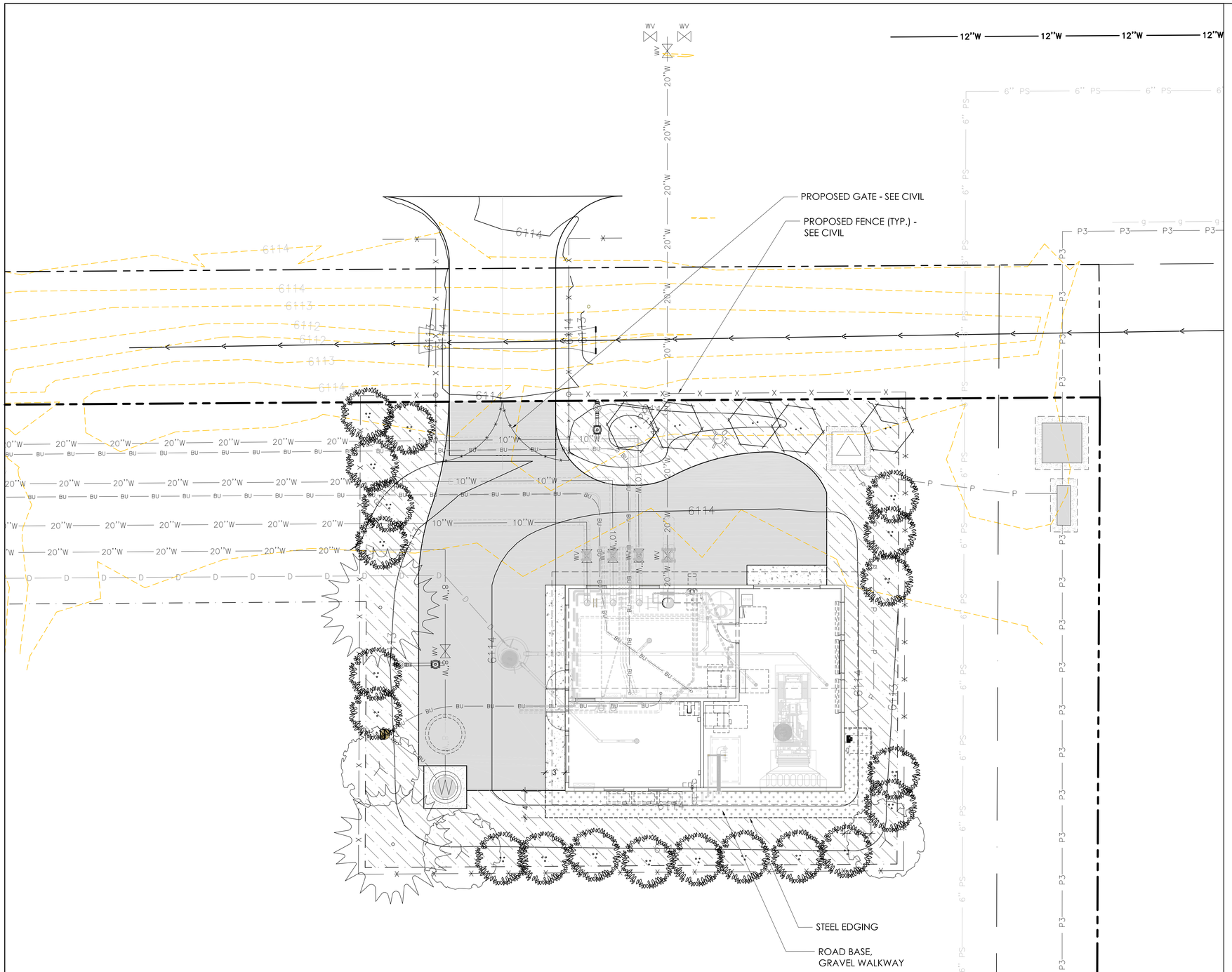
rooted landscape architecture
51 pine drive
star valley ranch, wy 83127
307.203.5520
www.rooted-la.com

High School Road Pump House
TOWN OF JACKSON

ISSUE	DATE
BID SET	08.20.2025

IRRIGATION DETAILS

IR3.2



LEGEND

- PROPERTY LINE
- ADJACENT PROPERTY LINE
- FUTURE EASEMENT
- EASEMENT
- LVE EASMENT
- EXISTING 1' CONTOUR

GENERAL NOTES

Zoning: RI

LSR Required: N/A

Plant Unit Requirement: N/A

PLANT SCHEDULE

SYMBOL	BOTANICAL NAME	COMMON NAME	SIZE	QTY.
DECIDUOUS TREES				
	Picea pungens	Colorado Spruce	14' H 16' H	1 1
	Populus tremuloides	Aspen	3" CAL	3
SHRUBS				
	Cornus sericea 'Baileyi'	Red-twig dogwood	4' H	5
	Salix sp.	Native willow shrub	6' H	20
GRASS AND SEED MIX				
	Meadow Sod - 2,100 SF			

PLANTING NOTES

1. Confirm all plant counts and square footages: quantities shown are provided as owner information only. If quantities indicated in the plant list differ from symbols shown on the plans, then the plans shall govern the plant count.

2. Carefully align and space plant materials as indicated in these notes, drawings and details.

3. Refer to civil engineer's utility and grading plans. If site conditions vary from what is shown, contact the landscape architect and civil engineer for direction before proceeding.

4. Excavation near underground utilities shall be done carefully and, if necessary, by hand. The contractor is fully responsible for this work and any disruption to utilities or damage to the site and/or improvements shall be repaired immediately at no expense to the owner.

5. Do not perform any pruning of existing or newly planted trees or shrubs without the direction and approval of the landscape architect. Coniferous trees shall be limbed up 6' for fire defensible space.

6. The irrigation system shall be operational prior to plant installation, or temporary irrigation measures shall be provided in the interim. The method of temporary irrigation shall be approved by the landscape architect prior to installing any plant material.

7. All trees and shrubs shall be drip irrigated. All disturbed areas shall be spray irrigated including native grass areas.

8. All plant material shall be irrigated for a minimum of 2 years until establishment.

9. Protect existing trees and their root zones during construction. Do not store materials or equipment under or near roots of trees. 6' tall construction fencing is recommended to protect on site trees to remain.

0 4 8 16 24 32 40 (N) 1"=8'

rooted
landscape architecture
51 pine drive
star valley ranch, wy 83127
307.203.5520
www.rooted-la.com

LICENSED LANDSCAPE ARCHITECT
PAULINE A. CHU
PLA-001129
Date: 8/24/25
STATE OF WYOMING

High School Road Pump House
TOWN OF JACKSON

ISSUE	DATE
BID SET	08.20.2025

PLANTING PLAN

L1.0

2025 HIGHS SCHOOL ROAD
PUMP HOUSE

ToJ PROJECT # 26-06

ADDENDUM NO. 1
Sept. 19th, 2025

NOTICE TO BIDDERS

This ADDENDUM shall be acknowledged on the BID FORM. Failure of any Bidder to properly acknowledge receipt of this Addendum both on this ADDENDUM and on the BID FORM may result in REJECTION OF THE BID.

This Addendum shall be attached to the Contract Documents and shall form a part thereof. The following changes, additions and/or deletions shall be made in the Specifications, Contract Documents and/or Drawings.

……

A complete package of the revised plans incorporating Addendum #1 can be downloaded at:

https://www.dropbox.com/scl/fi/bxs5zfd8b02q6e87b78zy/26-06-ToJ-HSR-Pump-House_ProjectManual_Bid-Set-Add.-1.pdf?rlkey=mlixd4mk7t6d92kttejqn5qw2&st=a9es17sh&dl=0

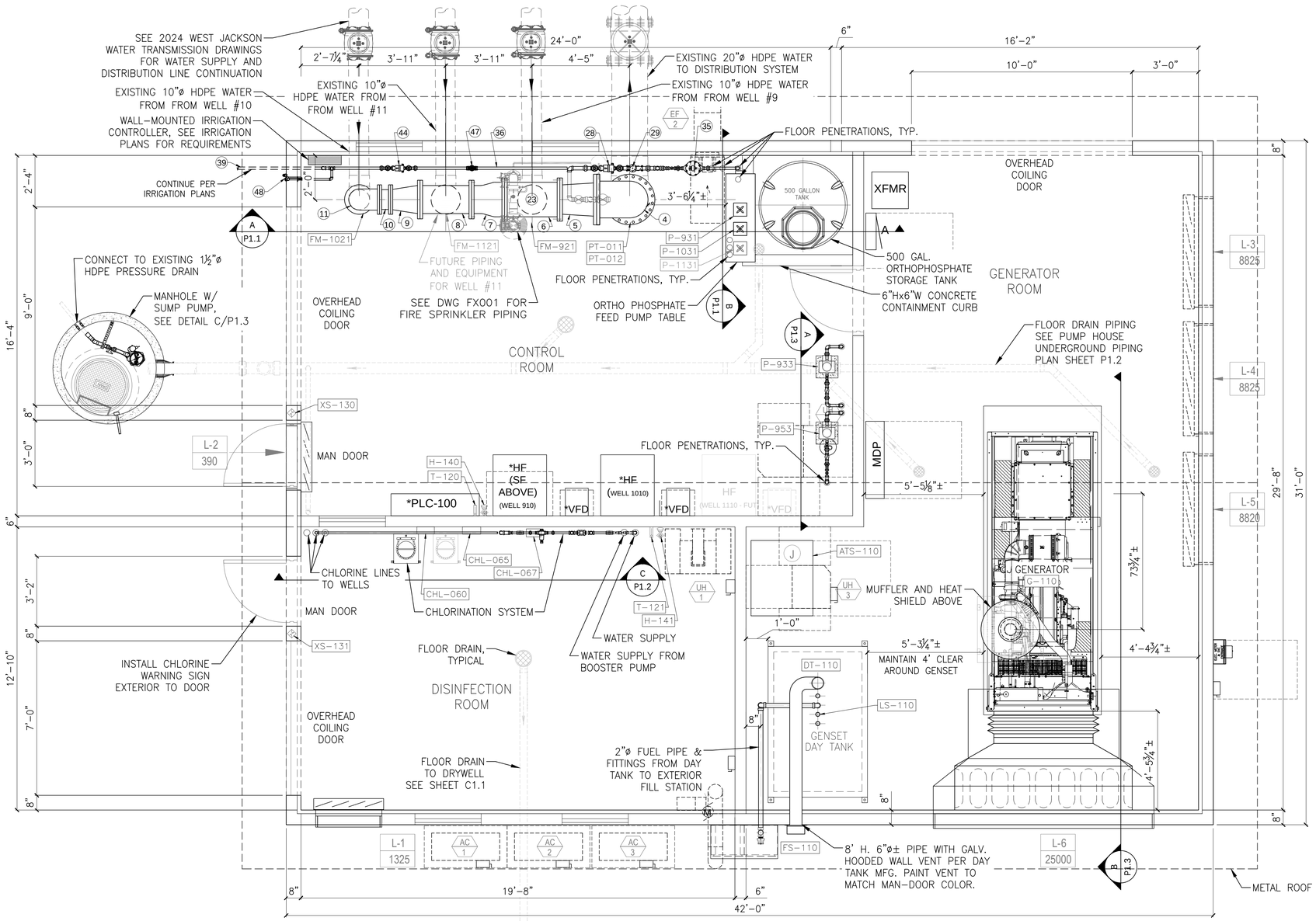
Revisions for this addendum are noted with "Add.#1" within each attachment below.

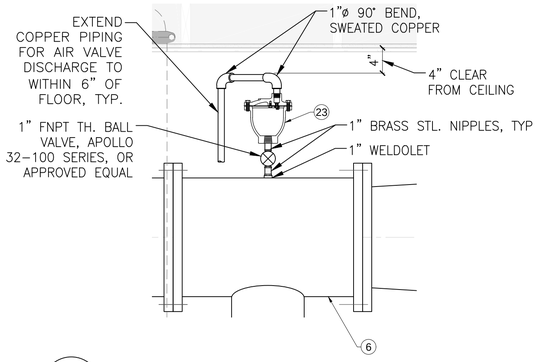
1. **REPLACE/REVISE** notes in drawings P1.0, P1.1, P1.2, P1.4, C1.1, G1.1, M1.0, E1.0 & E3.0. accordance with the attached.

2. **REVISE** specifications 26 24 16 and 32 12 16 per redlines on the attached.

Sincerely,

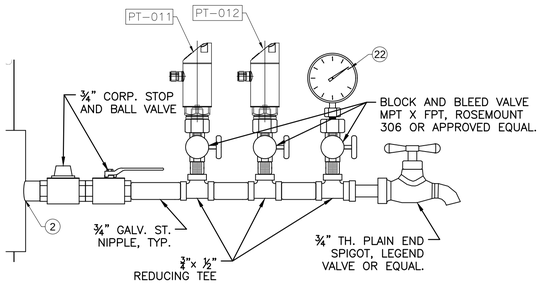
Josh Kilpatrick, PE
Project Manager
****





1 / P1.0 AIR VALVE DETAIL

Scale: N.T.S.



NOTES:
1. COMPLY WITH PROCESS AND CONTROL NOTES, THIS SHEET.
2. PIPE, PIPE FITTINGS AND VALVES MUST BE DESIGNED TO MEET SERVICE PRESSURES AT EACH LOCATION.
3. INSTALLATION ACCESSORIES (VALVES/SNUBBERS) ARE REQUIRED FOR EACH PRESSURE TRANSDUCER.
4. ALL VALVES, FITTINGS, AND EQUIPMENT SHALL BE BRASS OR STAINLESS STEEL.
5. PROVIDE BUSHINGS WHERE REQUIRED FOR INSTALLATION OF EQUIPMENT
6. COORDINATE INSTALLATION AND CALIBRATION WITH THE CONTROLS CONTRACTOR.

2 / P1.0 PRESSURE TRANSDUCER DETAIL

Scale: N.T.S.

Add. #1

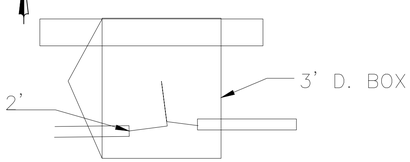
GENERAL PROCESS AND CONTROL NOTES:

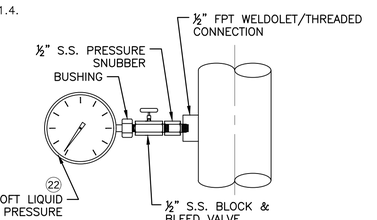
1. EXCEPT AS NOTED OTHERWISE IN THE PROCESS ("P.x") PLANS, CONTRACTOR SHALL INSTALL OWNER FURNISHED PROCESS AND CONTROL EQUIPMENT. IN COORDINATION WITH TOJ'S CONTROLS CONTRACTOR, CONTROL SYSTEMS TECHNOLOGY (CST), INSTALL CST FURNISHED PLC; FURNISH AND INSTALL REQUIRED CONDUITS/RACEWAYS FROM PROCESS EQUIPMENT TO THE PLC; AND FURNISH AND CONNECT ALL CABLING TO PROCESS EQUIPMENT AND PULL ALL CABLING FROM EQUIPMENT TO THE PLC. CONTRACTOR SHALL LABEL ALL WIRES AT THE PLC SO THAT CST CAN EASILY LAND/TERMINATE AT THE PLC FOR INTERFACING WITH PUMP HOUSE SCADA. COMPLY WITH SECTION 25 30 00 AND DIVISION 26 OF THE SPECIFICATIONS, AS WELL AS, NOTES BELOW AND THOSE PROVIDED ON G1.0–G1.5.
2. PROCESS EQUIPMENT CALLED FOR TO BE FURNISHED BY OWNER (*) SHALL BE PROVIDED BY ToJ's CONTROLS CONTRACTOR, CONTROLS SYSTEMS TECHNOLOGY (CST). CONTRACTOR SHALL COMPLY WITH NOTE 1 ABOVE REGARDING INSTALLATION.
3. NOT USED.
4. CONTRACTOR SHALL VERIFY ACTUAL QUANTITY OF FITTINGS BASED ON PLANS AND INSTALLATION CONSTRAINTS. ALL DRAINAGE AND CARRIER CONDUITS SHALL BE INSTALLED WITH "LONG" SWEEP FITTINGS AND BENDS.
5. ALL PIPE HANGERS, SUPPORTS AND ASSOCIATED HARDWARE SHALL BE STAINLESS STEEL. INSTALL ACCORDING TO SPACING REQUIREMENTS IN SPECIFICATION 22 05 29.
6. PROVIDE DIELECTRIC INSULATION BETWEEN COPPER ALLOY AND FERROUS MATERIALS.
7. LABEL PIPING AND EQUIPMENT IN ACCORDANCE WITH SECTION 40 05 53.
8. ALL CHLORINE GAS EQUIPMENT SHALL BE MANUFACTURED BY REGAL.
9. ALL DI PIPING, FITTINGS AND APPURTENANCES SHALL BE SHOP PRIMED AND FIELD COATED WITH 2–COATS OF TENEMEC SERIES N69, 3–5 MILS/ PER COAT, OR APPROVED EQUAL APPLY PER MFG RECOMMENDATIONS.

* PRESSURE TRANSDUCER LOCATED AT WELLS. SEE DETAILS ON SHEET P1.4.

PUMP HOUSE PROCESS PLAN

SCALE: 3/16"=1'-0" (11x17)

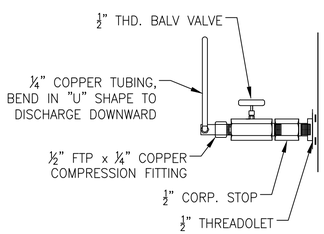




NOTES:
1. INSTALL ALL PRESSURE GAUGES WITH BLOCK AND BLEED VALVE AND PRESSURE SNUBBER.
2. ALL VALVES, FITTINGS, AND EQUIPMENT SHALL BE BRASS OR STAINLESS STEEL.

3 / P1.0 PRESSURE GAUGE DETAIL

Scale: N.T.S.



4 / P1.0 SAMPLING CONNECTION

Scale: N.T.S.

DATE	01/08/2025	REV.
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BKG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

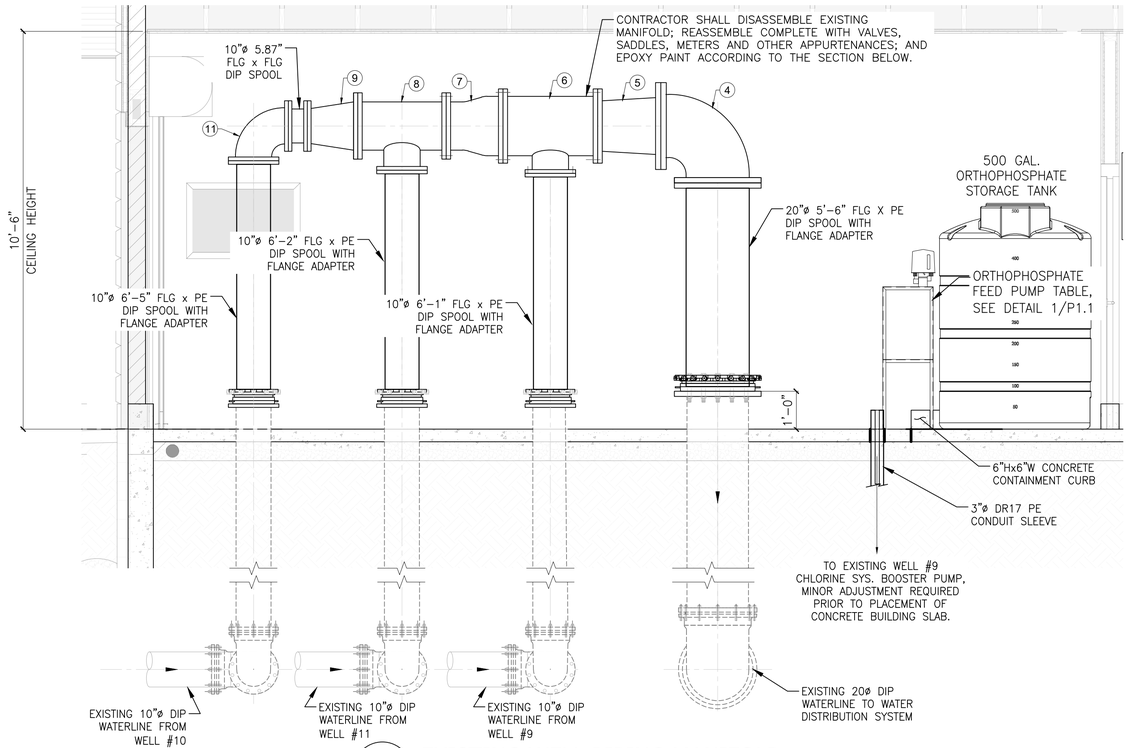
DRAWING TITLE: PUMP HOUSE PROCESS PLAN

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: P1.0

JOB NO: 23-302-02

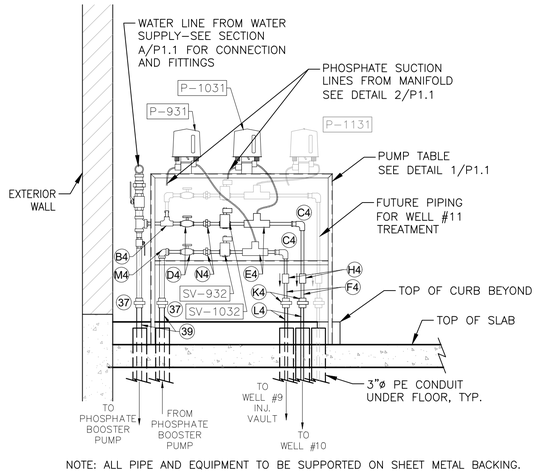
S:\Proj\2023\302-02 (to) high school rd water supply facilities\4 drawings\Civil\WSR WHYWELL HOUSE PROCESS PLANS.dwg 8½ PUMP HOUSE PROCESS PLAN - Sep 16, 2025 8:56:04 am PLOTTED BY: bkgarnick DWG FORMAT: 25D



A1 / P1.1 EXISTING WELL PIPING MANIFOLD

Scale: 1/4" = 1'-0" (11x17)

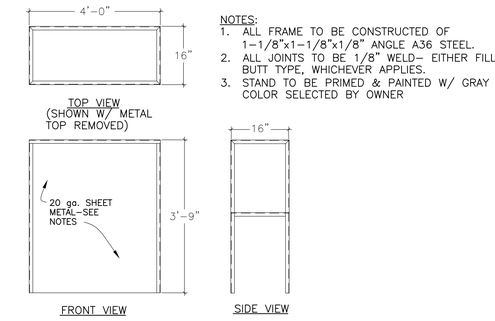
0 24 48



NOTE: ALL PIPE AND EQUIPMENT TO BE SUPPORTED ON SHEET METAL BACKING.

B / P1.1 ORTHOPHOSPHATE SYSTEM DETAIL

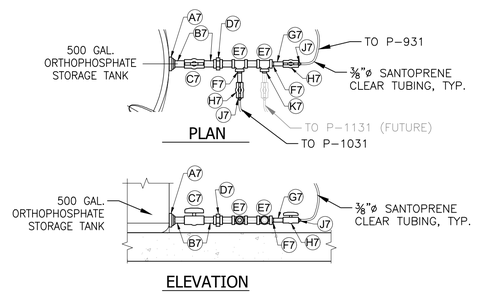
Scale: N.T.S.



NOTES:
1. ALL FRAME TO BE CONSTRUCTED OF 1–1/8"x1–1/8"x1/8" ANGLE A36 STEEL.
2. ALL JOINTS TO BE 1/8" WELD– EITHER FILLET OR BUTT TYPE, WHICHEVER APPLIES.
3. STAND TO BE PRIMED & PAINTED W/ GRAY ENAMEL, COLOR SELECTED BY OWNER

1 / P1.1 ORTHOPHOSPHATE PUMP TABLE DETAIL

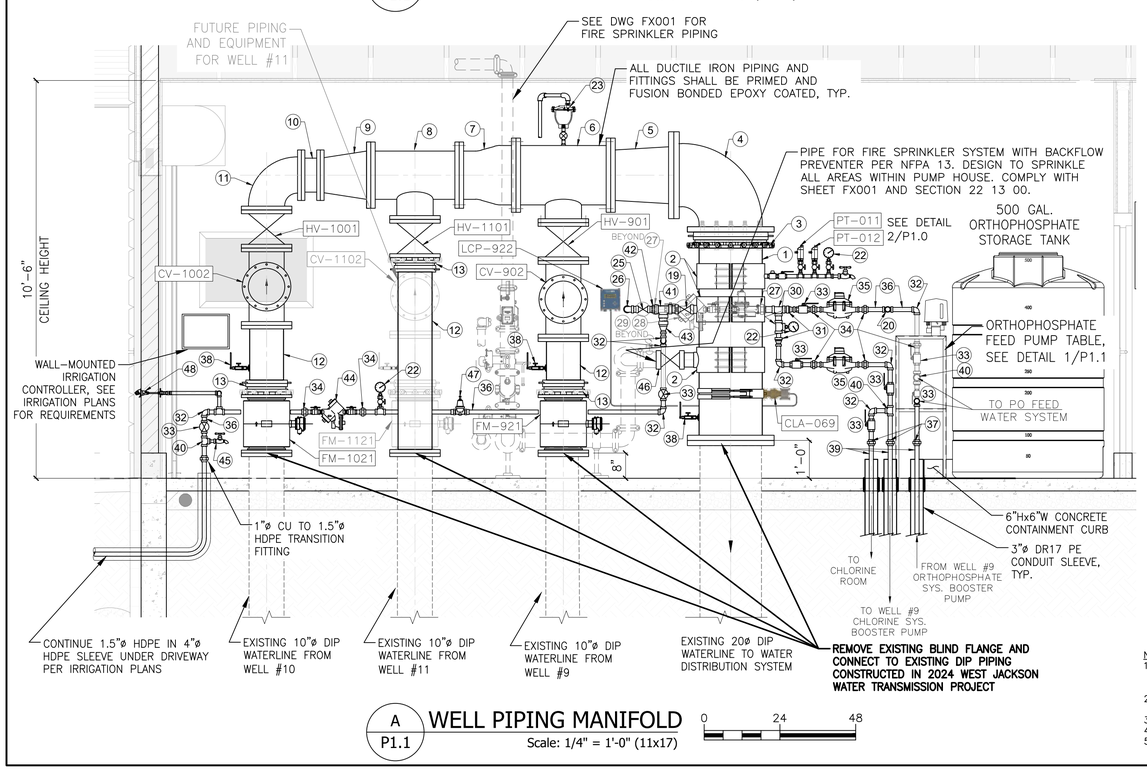
Scale: N.T.S.



2 / P1.1 ORTHOPHOSPHATE STORAGE TANK FEED MANIFOLD DETAIL

Scale: N.T.S.

NOTES:
1. CONTRACTOR SHALL VERIFY ACTUAL QUANTITY OF FITTINGS BASED ON PLANS AND INSTALLATION CONSTRAINTS. ALL DRAINAGE AND CARRIER CONDUITS SHALL BE INSTALLED WITH "LONG" SWEEP FITTINGS AND BENDS.
2. ALL PIPE HANGERS, SUPPORTS AND ASSOCIATED HARDWARE SHALL BE STAINLESS STEEL IN ACCORDANCE WITH SPECIFICATION 22 05 29.
3. PROVIDE DIELECTRIC INSULATION BETWEEN COPPER ALLOY AND FERROUS MATERIALS.
4. LABEL PIPING AND EQUIPMENT IN ACCORDANCE WITH SECTION 40 05 53.
5. ALL CHLORINE GAS EQUIPMENT SHALL BE MANUFACTURED BY REGAL



A / P1.1 WELL PIPING MANIFOLD

Scale: 1/4" = 1'-0" (11x17)

0 24 48

PIPE & EQUIPMENT SCHEDULE

MARK	SIZE	QUANTITY	DESCRIPTION	SPEC SECTION
WELL MANIFOLD / WATER SUPPLY				
HV-901 HV-1001 HV-1101		3	10"ø FLG GATE VALVE, RESILIENT SEATED NRS WITH HAND–WHEEL, AWWA C509–94	40 05 23.15
CV–902 CV–1002	10"ø	2	FLG CHECK VALVE, MUELLER A–3600 SWING TYPE W/ LEVER AND WEIGHT, AWWA C508	40 05 23.24
FM–921 FM–1021		2	* 10"ø FLG MAG METER, McCROMETER ULTRA MAG W/ PROCOMM CONVERTER	25 30 00
PT–011 PT–012		2	* PRESSURE SENSOR, 0–200 PSI RANGE (MIN.), IFM PN2293, SEE DETAIL 2/P1.0	25 30 00
1	20"ø	1	DI PIPE SPOOL, FLG x PE	40 05 13.53
2	20"ø	1	TAPPING SADDLE, SEE PLANS FOR OUTLET SIZE	40 05 13
3	20"ø	1	RESTRAINED FLANGE COUPLING ADAPTER	40 05 13
4	20"ø	1	90° BEND, FLG x FLG	40 05 13.53
5	20"x16"	1	DI REDUCER, FLG x FLG	40 05 13.53
6	16"x10"	1	DI REDUCING TEE, FLG x FLG	40 05 13.53
7	16"x14"	1	DI REDUCER, FLG x FLG	40 05 13.53
8	14"x10"	1	DI REDUCING TEE, FLG x FLG	40 05 13.53
9	14"x10"	1	DI REDUCER, FLG x FLG	40 05 13.53
10	10"ø	1	DI PIPE SPOOL, FLG x FLG	40 05 13.53
11	10"ø	1	90° BEND, FLG x FLG	40 05 13.53
12	10"ø	3	DI PIPE, PE x FLG	40 05 13.53
13	10"ø	3	RESTRAINED FLANGE COUPLING ADAPTER	40 05 13
19	2"ø	1	CORP STOP	33 12 13
20	3/4"ø	1	TEE WITH THREADED W/ HOSE BIB | 33 12 13 AND	22 11 19
22		3	PRESSURE GAUGE, SEE DETAIL 3/P1.0	22 11 19
23	1"ø	1	VALMATIC AIR RELEASE VALVE MODEL 22.3 W/ 3/32" ORIFICE, SEE DETAIL 1/P1.0	40 05 13
24	1–1/2"ø		SWEATED COPPER PIPE PE x PE	22 11 16
25	1–1/2"ø	1	ISOLATION VALVE	33 12 13
26	1–1/2"ø	2	90° BEND SWEATED COPPER	22 11 16
27	1–1/2"ø	2	COPPER UNION	22 11 16
28	1–1/2"ø	1	REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER ZURN 975XL OR EQUAL	22 11 19
29	1–1/2"ø	1	PRESSURE REDUCING VALVE WITH STRAINER, WATTS LF25AUB–Z3–HP, OR EQUAL	22 11 19
30	1–1/2"ø	2	TEE SWEATED COPPER	22 11 16
31	1–1/2"x1"	2	REDUCER SWEATED COPPER	22 11 16
32	1"ø	8	90° BEND SWEATED COPPER	22 11 16
33	1"ø	8	BALL VALVE BRASS/BRONZE	22 05 23
34	1"ø	7	UNION BRASS/BRONZE	22 11 16
35	1"	2	FLOW METER, NEPTUNE MACH 10 W/ FLOW RATE INDICATOR OR EQUAL	22 11 19
36	1"ø		SWEATED COPPER PIPE PE x PE	22 11 16
37	1"ø	4	COPPER HDPE TRANSITION FITTING	22 11 16
38	3/4"ø	3	SAMPLING PORT, SEE DETAIL 4/P1.0	22 11 16
39	1"ø	–	HDPE PIPE (IPS) DR11 PE4710, 200 PSI	22 11 16
40	1"ø	3	TEE SWEATED COPPER	22 11 16
41	2"ø	1	TEE SWEATED COPPER	22 11 16
42	2"x1–1/2"	1	REDUCER SWEATED COPPER	22 11 16
43	2"x1"	1	REDUCER SWEATED COPPER	22 11 16
44	1"ø	1	REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER ZURN 975XL OR EQUAL	22 11 19
45	3/4"ø	1	THREADED SPIGOT FOR IRRIGATION SYSTEM	22 11 19
46	4"ø	1	ISOLATION VALVE FOR FIRE SPRINKLER SYSTEM CONNECTION	33 12 13
47	1"ø	1	WILKINS DOUBLE UNION PRESSURE REDUCING VALVE OR EQUAL	22 11 19
48	3/4"ø	1	WOODFORD MODEL 65 FREEZLESS ANTI–SIPHON WALL HYDRANT OR EQUAL	22 11 19
ORTHOPHOSPHATE SYSTEM				
P–931 P–1031		2	* PERISTALTIC PUMP, (12 GPD, 150 PSI) PULSATRON, MODEL LMB3TA , OR EQUAL	46 33 44
P–933	3/4 HP	1	VERTICAL TURBINE BOOSTER PUMP (6.5 GPM @ 110–FT TDH), GRUNDFOS CRE 1–6 WITH INTEGRAL VFD, OR EQUAL, SEE DETAIL A/P1.3	43 21 13
64	3/4 "ø	1	PVC TEE, SCH 80 PVC, THREADED	22 11 16
62	3/4 "ø	2	90° BEND, SCH 80 PVC, THREADED	22 11 16
58	3/4 "ø	2	BALL VALVE	40 05 23.12
59	3/4 "ø	2	INJECTION TEE, 3/4" PVC W/ 3/8"ø TUBE ADAPTER	22 11 16
63	3/4 "ø	–	SCH 80 PVC PIPE	22 11 16
SV–932	SV–1032	2	3/4" SOLENOID VALVE, NORMALLY OPEN, PLAST–O–MATIC ZC SERIES WITH CAFE–N ELECTRONIC ACTUATOR	40 05 23.72
64	3/4 "ø	2	PVC CHECK BALL VALVE COMBO	40 05 23.24
60	3/4 "ø	2	TRANSITION COUPLING, 3/4" PE x 3/4" PVC	22 11 16
L4	3/4 "ø	–	HDPE PIPE (IPS) DR11 PE4710, 200 PSI	22 11 16
66	1 "ø	1	90° BEND, SCH 80 PVC, THREADED, WITH 3/4" REDUCING BUSHING	22 11 16
68	3/4 "ø	3	UNION, PVC	22 11 16
ORTHOPHOSPHATE FEED MANIFOLD				
A7	2"ø	1	PVC BULKHEAD FITTING WITH 2"x1–1/2" AND 1–1/2"x1" BUSHINGS	22 11 16
B7	1"ø	–	PIPE, SCH 40 PVC, THREADED	22 11 16
C7	1"ø	1	PVC BALL VALVE	40 05 23.12
D7	1"ø	1	PVC UNION	22 11 16
E7	1"ø	2	PVC TEE	22 11 16
F7	1"x1/2"	2	BUSHING	22 11 16
G7	1/2"ø	–	PIPE, SCH 40 PVC, THREADED	22 11 16
H7	1/2"ø	2	PVC BALL VALVE	40 05 23.12
J7	1/2"x3/8"	2	PLASTIC, QUICK CONNECT ADAPTER FOR 3/8" PE TUBING	22 11 16
K7	1/2"	1	PLUG FOR FUTURE WELL 11 CONNECTION	22 11 16
CHLORINE SYSTEM			Add. #1	
CHL–061 CHL–062		2	* SWITCHOVER GAS CHLORINATOR	46 31 11
CHL–952 CHL–1052		2	* SMART VALVE, REGAL 7001–25 PPD	46 31 11
CHL–063	–	1	* PRESSURE RELIEF VALVE	46 31 11
CHL–954 CHL–1054		2	* EJECTOR, REGAL 25 PPD, WITH NO. 3A NOZZLE	46 31 11
CHL–060	–	1	* DUAL CYLINDER SCALE, REGAL ECS402 – 2 WEIGHT SCALES PROVIDED	46 31 11
CHL–065	–	1	* CHLORINE GAS LEAK DETECTOR, REGAL 3000 – SEE NOTE 4, DETAIL C/P1.1	46 31 11
CHL–953 CHL–1053		2	* METER ASSEMBLY, REGAL 7500	46 31 11
CHL–067	–	1	* I/O CONTROL MODULE	40 94 33
CLA–069		1	* CHLORINE ANALYZER, INCLUDING HALOGEN 4–20mA MP5 DISPLAY LCP–069 AND MP5 SENSOR, COMPLETE WITH 2" TAPPING SADDLE, VALVE, AND REQUIRED ACCESSORIES	40 94 33
SV–955 SV–1055		2	* 3/4 " & 1" SOLENOID VALVE, SAME MAKE AS SV–932 ABOVE	40 05 23.72
P–953	1–1/2 HP	1	VERTICAL TURBINE BOOSTER PUMP (6.5 GPM @ 250–FT TDH), GRUNDFOS CRE 1–13 WITH INTEGRAL VFD, OR EQUAL, SEE DETAIL A/P1.3	43 21 13
A2	3/4"ø	–	PIPE, SCH 80 PVC, THREADED	40 05 13.73
B2	3/4"ø	2	PVC BALL VALVE	40 05 23.12
C2	3/4"ø	2	UNION, SCH 80 PVC	40 05 13.73
D2	3/4"x 1/4"	2	TEE W/ PRESSURE GAUGE, SEE DETAIL 3/P1.0	22 11 19
E2	3/4"ø	4	90° BEND, SCH 80 PVC, THREADED	40 05 13.73
F2	3/4"ø x 1/2"ø	1	VACUUM BREAKER – TEE, W/ 1/2" BALL CHECK VALVE, ANTI SYPHON	22 11 19
G2	3/4"ø	1	TRANSITION COUPLING, 3/4" PE x 3/4" PVC	22 11 16
K2	3/4"ø	–	FLEXIBLE PIPE, PE 4710 DR9 (250 PSI)	40 05 13.73
J2	1"x3/4"	1	REDUCER, SCH 80 PVC	22 11 16
J2	1"x3/4"	1	REDUCING TEE, SCH 80 PVC	22 11 16
K2	3/4"	1	CAP FOR FUTURE WELL #11 CONNECTION	22 11 16
M2	1"ø	5	TRANSITION COUPLING, PE x PVC	22 11 16
N2	1"ø	–	PIPE, SCH 80 PVC, THREADED	40 05 13.73
P2	1"ø	1	TRANSITION COUPLING, 1" PE x 1" PVC	22 11 16
P2	1"ø	4	PVC BALL VALVE	40 05 23.12
Q2	1–1/4"ø	1	UNION, PVC	22 11 16
R2	1"ø	8	90° BEND, SCH 80 PVC	22 11 16
S2	1"ø x 1/2"ø	1	VACUUM BREAKER – TEE, W/ 1/2" BALL CHECK VALVE, ANTI SYPHON	22 11 19
U2	1"x 1/4"	2	TEE W/ PRESSURE GAUGE, SEE DETAIL 3/P1.0	22 11 19
GENERATOR SYSTEM				
G–110	–	1	500 KW CUMMINS MODEL 500DFEK DIESEL GENERATOR, OR EQUAL	26 32 13
ATS–110	–	1	CUMMINS AUTOMATIC TRANSFER SWITCH, OR EQUAL	26 32 13
DT–110	–	1	PRYCO STANDARD DOUBLE WALL DAY TANK (560 GAL.) MODEL PY700DW, OR EQUAL. VENT TANK TO THE BUILDING EXTERIOR AS REQUIRED BY MFG.	26 32 13
FS–110	–	1	PRYCO MODEL 230 REMOTE FILL STATION COMPLETE WITH CONTROL PANEL (FUEL LEVEL ALARM) AND FUELING COMPARTMENTS, OR EQUAL	26 32 13
LS–110	–	1	DAY TANK FUEL LEVEL SENSOR BY DAY TANK FG.	26 32 13
T–120 T–121		2	* TEMPERATURE SENSORS	25 30 00
XS–130 XS–131		2	* MAGNETIC DOOR INTRUSION SENSORS	25 30 00
H–140 H–141		2	* HUMIDITY SENSORS	25 30 00

* – SEE NOTES ON SHEET P1.0 Add. #1

REV.	DATE	
	01/08/2025	
	n/a	SURVEYED
	JK	ENGINEERED
	BJG/JK	DRAWN
		CHECKED
		APPROVED

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733–2087

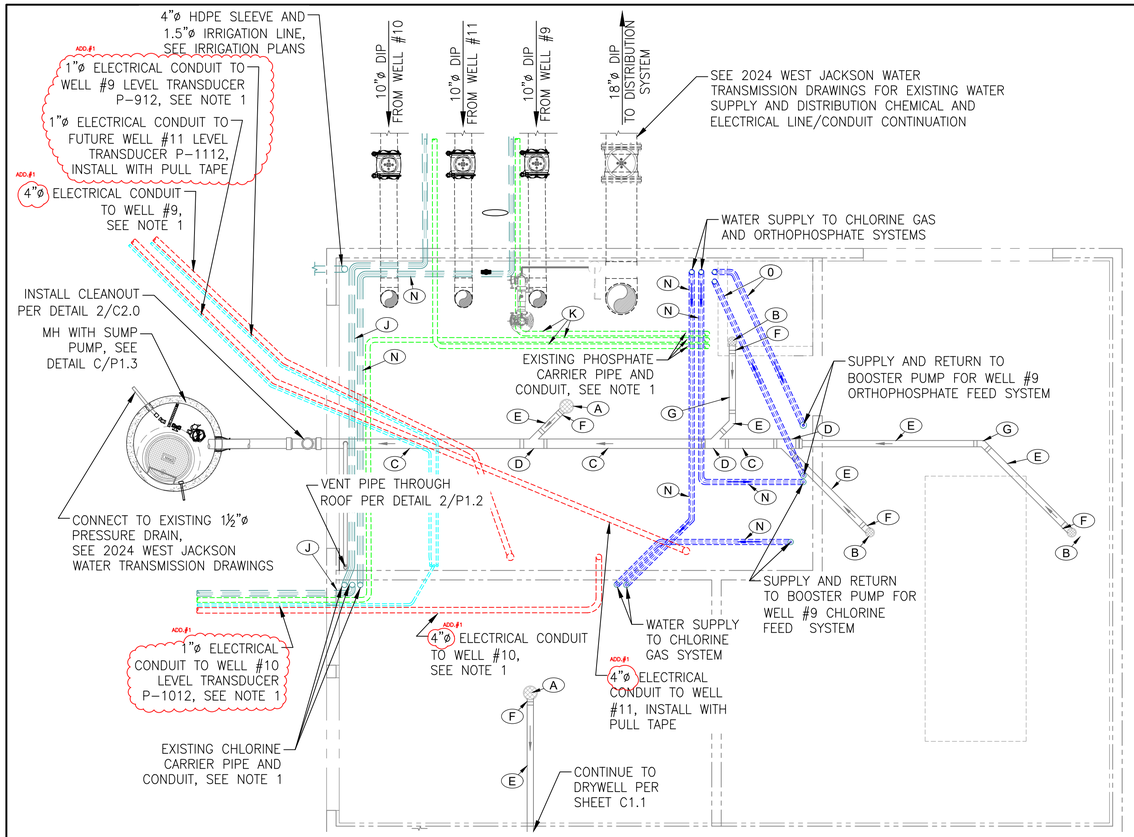
DRAWING TITLE: PUMP HOUSE PROCESS DETAILS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: P1.1

JOB NO: 23–302–02

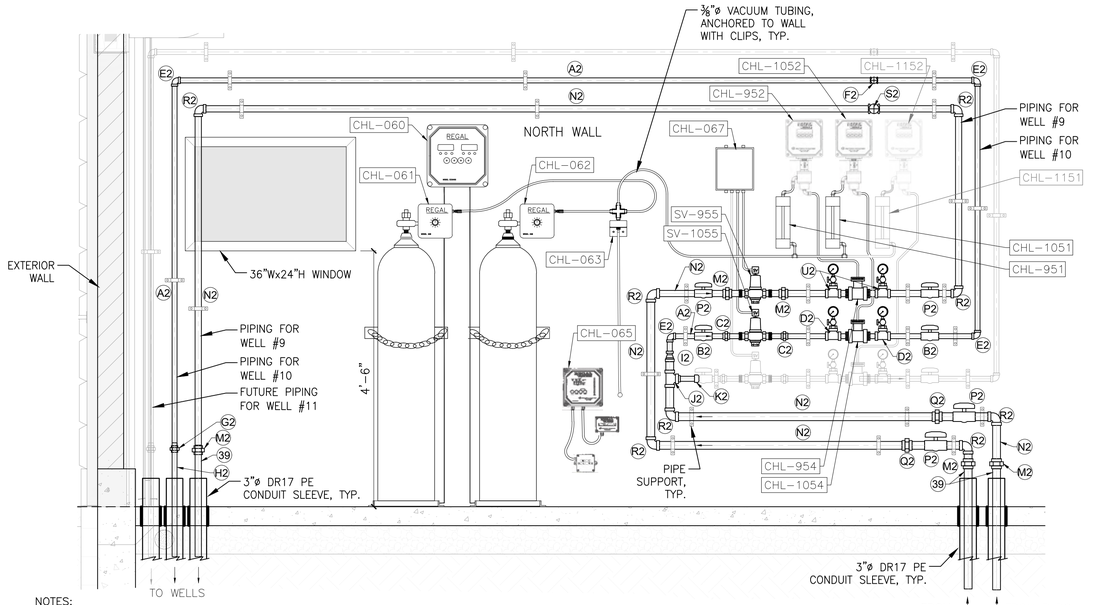
S:\Proj\2023\302-02 (tsj high school rd water supply fac)\dwgs\Civil\WSR WELL HOUSE PROCESS PLANS.dwg @PUMP HOUSE PROCESS DETAILS - Sep 16, 2025 @9:01 am PLOTTED BY bdpatrick DWG FORMAT: ISO



NOTES:
1. PLAN INDICATES BELOW SLAB CONDUIT AND PIPE REQUIREMENTS. NOT ALL ELECTRICAL CONDUITS ARE SHOWN. SEE ELECTRICAL PLANS FOR COORDINATION OF ADDITIONAL BELOW SLAB CONDUITS FOR ELECTRICAL EQUIPMENT.
2. SLOPE DRAIN PIPE AT 2% (MIN.). PROVIDE PIPE BEDDING FOR ALL BURIED PIPE.
3. SLOPE CONCRETE SLABS AT 1% MIN./2% MAX. TO ALL DRAIN LOCATIONS.
4. THE FOLLOWING CONDUITS AND PIPE WILL BE STUBBED UP AT APPROXIMATE LOCATIONS SHOWN IN PLAN ABOVE UNDER THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT. ALL OTHER CONDUITS SHALL BE INSTALLED BY CONTRACTOR UNDER THIS PROJECT.
   - 4.1. POWER CONDUITS AT EACH VFD FOR EACH WELL, INCLUDING FUTURE WELL #11.
   - 4.2. CHLORINE SOLUTION LINES FOR EACH WELL (3 EA.) NEAR THE CHLORINE ENTRY DOOR.
   - 4.3. COMMUNICATION CONDUIT FOR WELL WATER LEVEL PRESSURE TRANSDUCERS (3 EA.) AT THE PLC.
5. CONDUITS DESCRIBED AS "EXISTING" HAVE BEEN INSTALLED AND STUBBED UP AT LOCATIONS PER THIS PLAN. MINOR ADJUSTMENTS IN FINAL LOCATION MAY BE REQUIRED DEPENDING ON FINAL LAYOUT OF EQUIPMENT. CONTRACTOR SHALL VERIFY FINAL LOCATIONS WITH EQUIPMENT SUPPLIERS AND ENGINEER.

PUMP HOUSE UNDERGROUND PIPING PLAN

SCALE: 1/8" = 1'-0" (11x17)



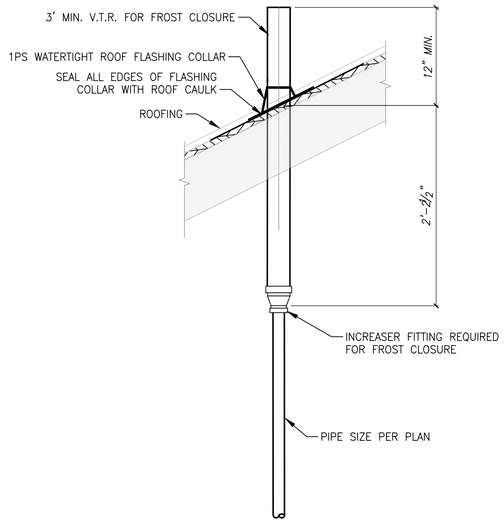
NOTES:
1. UNLESS OTHERWISE NOTED, ALL PIPE INSIDE THE CHLORINE ROOM SHALL BE SCHEDULE 80 PVC.
2. ALL PIPE SHALL BE ANCHORED TO WALL W/ PVC SUPPORTS.
3. ALL CHLORINATION EQUIPMENT SHALL BE SUPPLIED BY REGAL, AND PURCHASED AND INSTALLED BY CST WITH EXCEPTION TO PVC PIPING AND ASSOCIATED EQUIPMENT. COMPLY WITH NOTES ON SHEET C1.3.
4. INSTALL CHLORINE GAS AUDIO AND ALARM LIGHT EXTERIOR TO THE BUILDING AND ADJACENT TO THE CHLORINE ROOM ACCESS DOOR.
5. MOUNT WARNING SIGN ON ACCESS DOOR AS NOTED ON P1.0, AND SUPPLY AND STORE RESPIRATOR AND CYLINDER REPAIR KIT IN THE PROCESS ROOM AT A LOCATION IDENTIFIED BY OWNER.

C / P1.2 CHLORINATION SYSTEM DETAIL

Scale: N.T.S.

PUMP HOUSE UNDERGROUND DRAIN PIPE, CONDUIT & FITTING SCHEDULE			
ITEM	QTY	DESCRIPTION	SPEC. SECTION
Ⓐ	2	9"ø FLOOR DRAIN W/P-TRAP, ZURN Z520 W/ 4"ø OUTLET AND SURESEAL FLOOR DRAIN TRAP SEALER, OR EQUAL	22 13 19
Ⓑ	3	6"ø FLOOR DRAIN W/P-TRAP, ZURN FD-2340 W/ 4"ø OUTLET AND SURESEAL FLOOR DRAIN TRAP SEALER, OR EQUAL	22 13 19
Ⓒ	–	6"ø PIPE, SCH 40 PVC, SLIP FIT, LENGTH AS REQ'D	22 13 16
Ⓓ	3	6"x6"x4" SWEEP WYE, SCH 40 PVC, SLIP FIT	22 13 16
Ⓔ	–	4"ø PIPE, SCH 40 PVC, SLIP FIT, LENGTH AS REQ'D	22 13 16
Ⓕ	5	4"ø 90° BEND, SCH 40 PVC, SLIP FIT	22 13 16
Ⓖ	2	4"ø 45° BEND, SCH 40 PVC, SLIP FIT	22 13 16
Ⓙ	–	3"ø DR17 PE CONDUIT, W/ LONG SWEEP BENDS, LENGTH AS REQ'D (FOR ¾"ø CHLORINE LINES)	22 13 16
Ⓚ	–	3"ø DR17 PE CONDUIT, W/ LONG SWEEP BENDS, LENGTH AS REQ'D (FOR ¾"ø ORTHOPHOSPHATE LINES)	22 13 16
Ⓝ	–	3"ø DR17 PE CONDUIT, W/ LONG SWEEP BENDS, LENGTH AS REQ'D (FOR 1"ø CHLORINE LINES)	22 13 16
Ⓞ	–	3"ø DR17 PE CONDUIT, W/ LONG SWEEP BENDS, LENGTH AS REQ'D (FOR 1"ø ORTHOPHOSPHATE LINES)	22 13 16

NOTES:
1. CONTRACTOR SHALL VERIFY ACTUAL QUANTITY OF FITTINGS BASED ON PLANS AND INSTALLATION CONSTRAINTS.
2. ALL DRAINAGE AND CARRIER CONDUITS SHALL BE INSTALLED WITH "LONG" SWEEP FITTINGS AND BENDS. COMPLY WITH SECTION 22 13 16.



1 / P1.2 PLUMBING VENT THROUGH ROOF

Scale: N.T.S.

REV.	DATE	
	SURVEYED	01/08/2025
	ENGINEERED	n/a
	DRAWN	JK
	CHECKED	BJG/JK
	APPROVED	

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE: PUMP HOUSE UNDERGROUND PIPING PLAN & PROCESS DETAILS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: P1.2

JOB NO: 23-302-02

S:\Proj\2023\302-02 (toj) high school rd water supply footbrink drawings\Civil\HSR WH\WELL HOUSE PROCESS PLANS.dwg (PUMP HOUSE PROCESS DETAILS (2)) - Sep 18 2025 05:05:05 pm PLOTTED BY: kbedrick DWG FORMAT: 25.0

CONTRACTOR REQUIREMENTS

WORK ON EACH WELL WAS COMPLETED IN THREE PHASES. PHASE I AND II WORK HAS ALREADY BEEN, OR WILL BE COMPLETED BY OTHERS. **PHASE III WORK, DESCRIBED BELOW, IS REQUIRED FOR THIS PROJECT.**

PHASE I (BY OTHERS)

DRILL, TEST AND PERMIT WELLS #9 AND #10.

PHASE II (BY OTHERS)

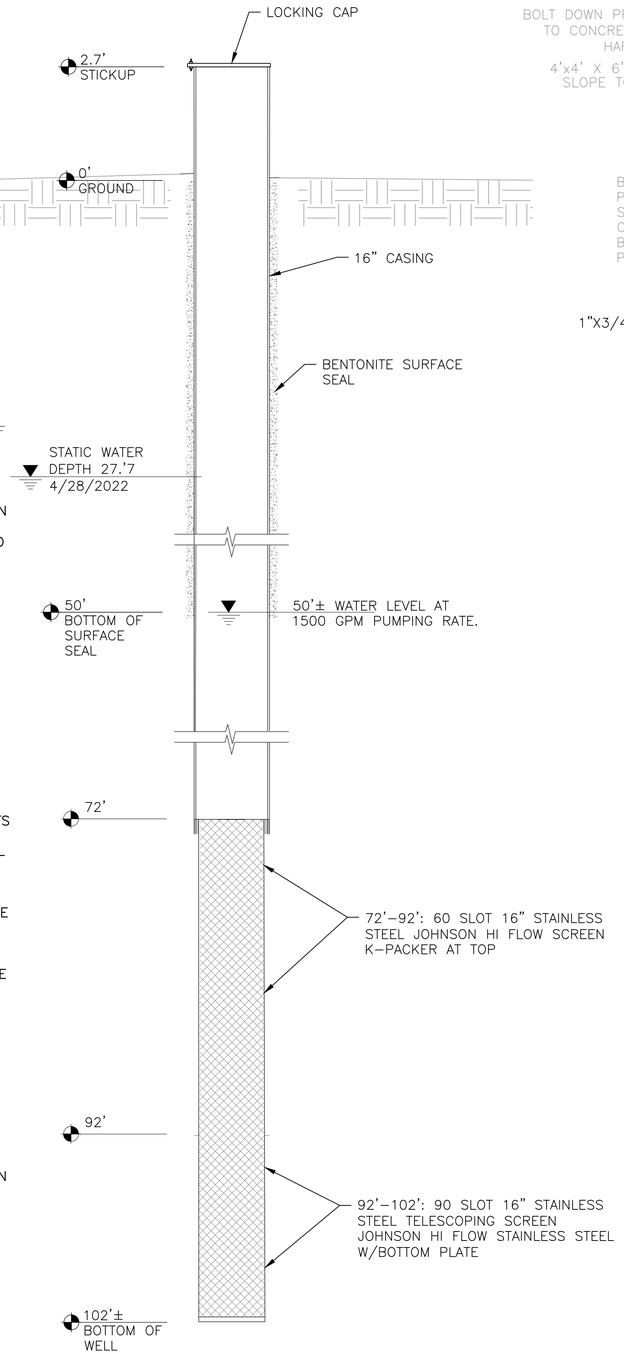
IN ACCORDANCE WITH DETAIL 2/P1.4, WORK AT EACH WELL INCLUDES:

1. CUT WELL CASING AND INSTALL PITLESS ADAPTOR. CONNECT WATER SUPPLY LINE TO PITLESS.
2. FOR WELL #10 ONLY, INSTALL CHEMICAL (CHLORINE AND POLYP) PITLESSES (2 EA.) AND CONNECT TO BURIED CHEMICAL PIPING. TERMINATE CARRIER CONDUIT W/IN 2' OF WELL HEAD AND SEAL ANNULUSES BETWEEN CHEMICAL LINE AND CARRIER PIPE WITH MECHANICAL SEAL, SILICON OR OTHER APPROVED PRODUCT.
3. INSTALL WELL CAP AND ELECTRICAL POWER CONDUIT FROM THE WELL CAP TO FUTURE LOCATION OF THE WELL DISCONNECT; THIS IS THE SAME LOCATION WHERE POWER SUPPLY WILL BE STUBBED UP AND CAPPED ABOVE GRADE PER PLAN. COORDINATE LOCATION OF FUTURE DISCONNECT WITH OWNER/ENGINEER. ELECTRICAL CONDUIT ABOVE GRADE SHALL BE GALVANIZED STL. IN ACCORDANCE WITH NEC.
4. CONNECT 1"ø CONDUIT FOR FUTURE PRESSURE TRANSDUCER CABLE TO WELL CAP.
5. INSTALL CONCRETE WELL PAD AND WELL ENCLOSURE.
6. COMPLETE ALL REQUIRED EXCAVATION AND BACKFILL. THIS INCLUDES PIPE BEDDING AND RE-ESTABLISHMENT OF THE GROUT SEAL AROUND THE WELL HEAD FROM THE BOTTOM OF THE DISCONNECT TO FINISH GRADE.

PHASE III (THIS PROJECT)

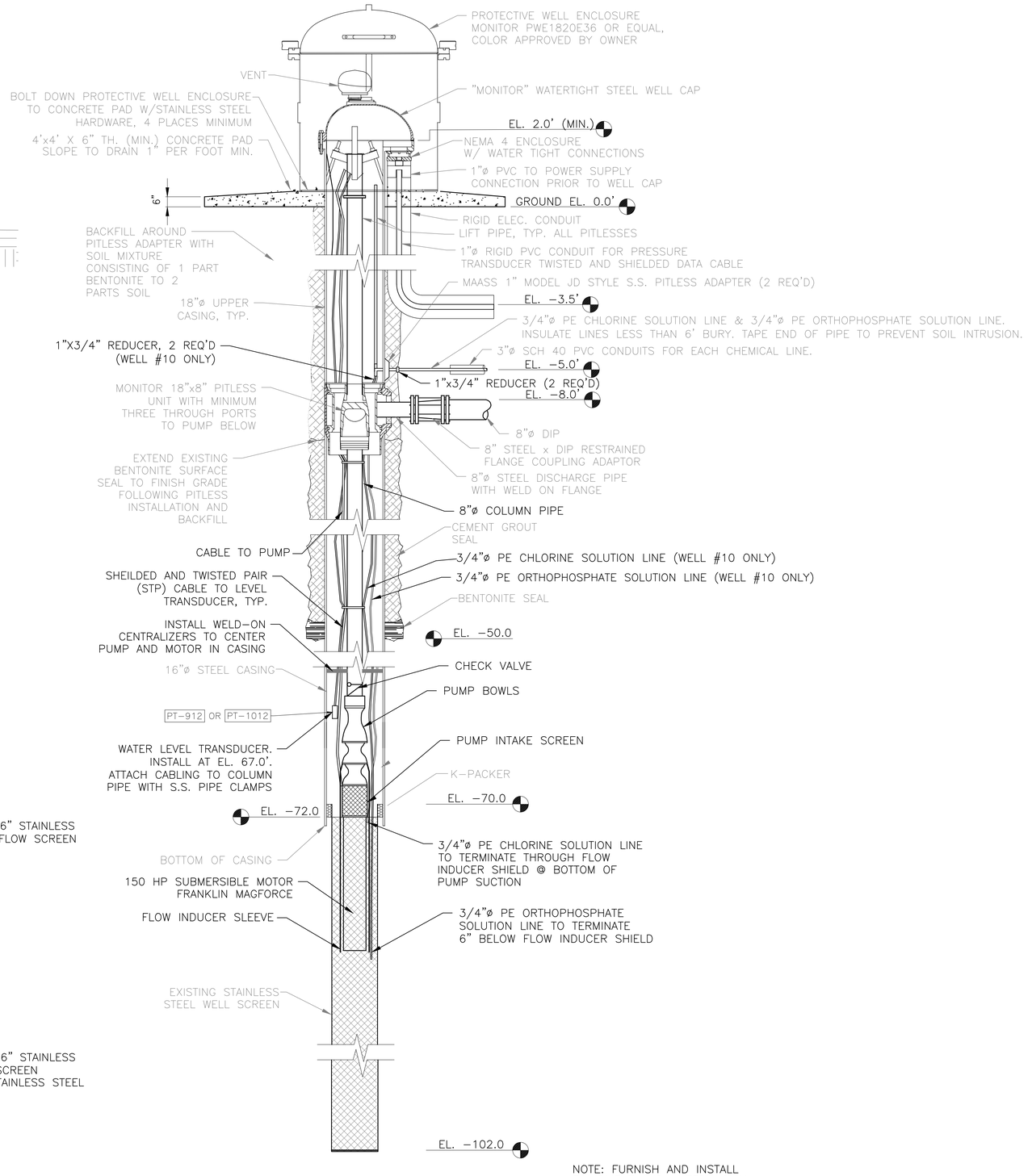
IN GENERAL, WORK INCLUDES INSTALLING ALL EQUIPMENT AND ELECTRICAL FOR FINAL WELL COMPLETION; WORK NOT INCLUDED IN PHASE I OR II WORK. PHASE III WORK INCLUDES COMPLETION OF THE WELL IN ACCORDANCE WITH DETAIL 2/P1.4 AND ITEMS LISTED BELOW.

1. REMOVE WELL PROTECTIVE COVER, CAP AND PITLESS AND FURNISH AND INSTALL PUMP, MOTOR, FLOW INDUCER, PUMP/MOTOR CENTRALIZERS, CHECK VALVE AND COLUMN PIPE. CONTRACTOR SHALL CONFIRM CONNECTIONS TO EXISTING PITLESS ADAPTOR PRIOR TO ORDERING PARTS AND EQUIPMENT.
2. FURNISH AND INSTALL WELL DISCONNECT & PEDESTAL (MYERS, ERICSON, OR EQUAL)TO WELL MOTOR. NOTE: EXISTING BURIED CONDUITS ARE ALREADY STUB UP AT DISCONNECT LOCATION. ADD.#1
3. FURNISH AND INSTALL (PULL) ALL ELECTRICAL CONDUCTORS FROM THE PUMP HOUSE AND WELL PUMP MOTOR, AND TERMINATE AT THE WELL DISCONNECT. PROVIDE ALL NECESSARY EQUIPMENT AND CONNECTIONS REQUIRED FOR WELL OPERATION. NOTE: THE MAJORITY OF EXISTING CONDUITS AND PULL STRINGS WERE INSTALLED UNDER PHASE II WORK; SEE SHEET C1.1 FOR ADDITIONAL BURIED CONDUIT AND PULL BOX REQUIREMENTS AT THE PUMP HOUSE.
4. FURNISH AND INSTALL PRESSURE TRANSDUCER IN WELLHEAD. FURNISH AND INSTALL (PULL) CABLE FROM THE PUMP HOUSE TO THE WELLHEAD FOR THE PRESSURE TRANSDUCER. PROVIDE ALL NECESSARY EQUIPMENT AND CONNECTIONS REQUIRED FOR INSTRUMENT OPERATION. NOTE: EXISTING CONDUITS AND PULL STRINGS WERE INSTALLED UNDER PHASE II WORK; SEE SHEET C1.1 FOR ADDITIONAL BURIED CONDUIT AND PULL BOX REQUIREMENTS AT THE PUMP HOUSE.
5. FOR WELL #10 ONLY, FURNISH AND INSTALL LIFT AND DROP/COLUMN PIPES FOR CHEMICAL FEED (2 EA.) TO WELL CASING DEPTHS INDICATED IN DETAIL 2/P1.4. CONNECT PIPE TO EXISTING PITLESS ADAPTORS AND ATTACH PE PIPE TO PUMP COLUMN PUMP COLUMN PIPE.
6. SECURE ALL CABLES AND CHEMICAL PIPES TO CENTER COLUMN PIPE WITH S.S. BANDS, OR APPROVED EQUAL. CONTRACTOR SHALL PROVIDED ALL NECESSARY EQUIPMENT AND ATTACHMENTS SO THAT ALL PIPE AND EQUIPMENT WITHIN THE WELL CASING CAN BE READILY PULLED FROM THE WELL FREE OF DAMAGE.
7. COMPLETE WELL STARTUP, COMMISSIONING AND TRAINING. COORDINATE WITH ToJ's CONTROLS CONTRACTOR, CONTROLS SYSTEMS TECHNOLOGY (CST).



1 / P1.4 EXISTING WELL #9 & #10

Scale: N.T.S.



2 / P1.4 WELL #9 & #10 COMPLETION

Scale: N.T.S.

NOTE: FURNISH AND INSTALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH 33 21 13 – PUBLIC WATER SUPPLY WELLS.

DATE	7/24/2024	REV.
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

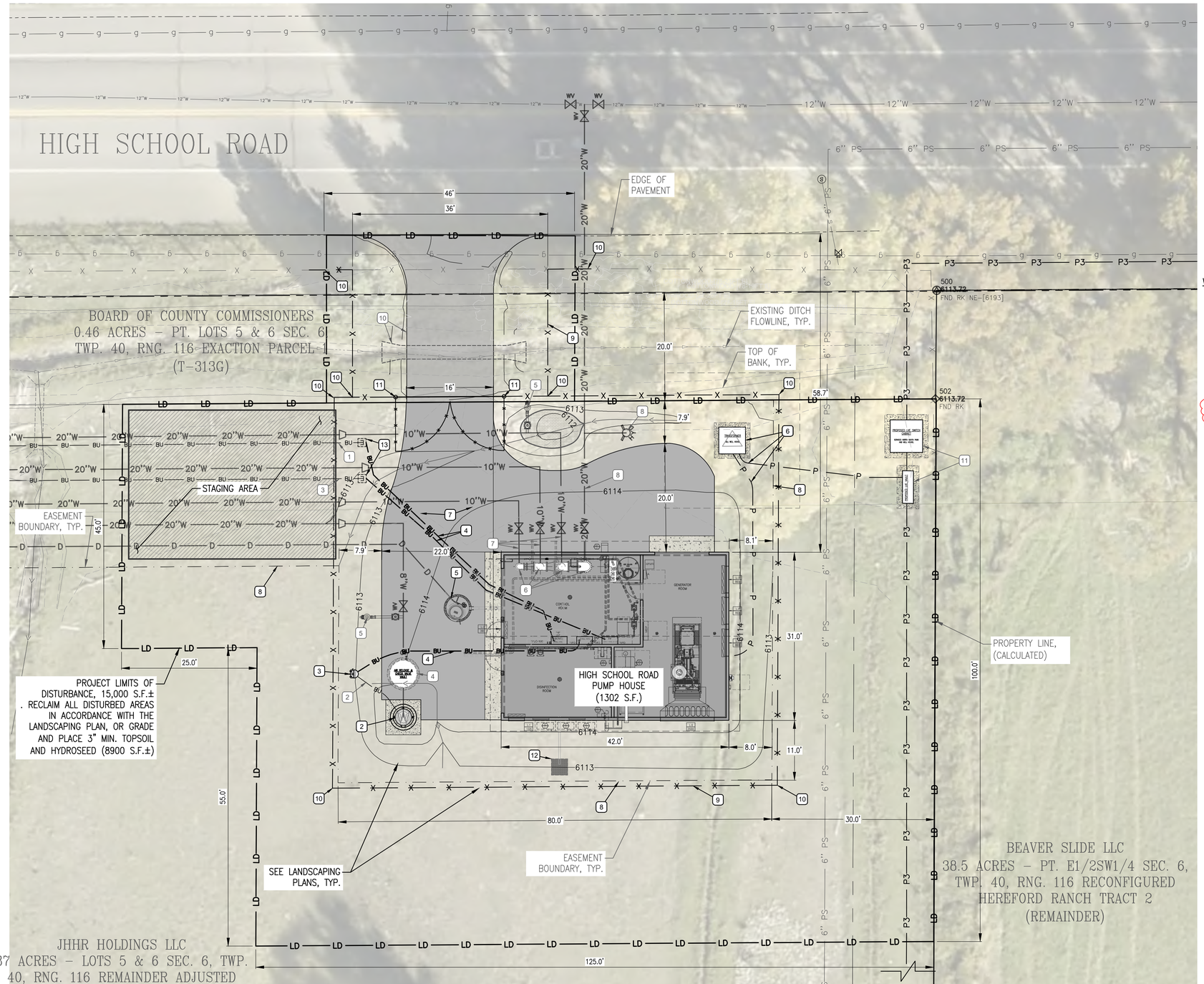
DRAWING TITLE: WELL NO. 9 & 10 DETAILS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL HOUSE TOWN OF JACKSON, WY

DRAWING NO: P1.4

JOB NO: 23-302-02

S:\Proj\2023\302-02 (ToJ) High school rd water supply facilities\4 drawings\Civil\HSR WELL 9 & 10 DETAILS.dwg 6P14 WELL NO. 9 & 10 DETAILS - Sep 18 2025 03:02:23 pm PLOTTED BY: kbostwick DWG FORMAT: 25.0



HSR PUMP HOUSE SITE PLAN

SCALE: 1" = 20' (11x17)

0 10 20

CONSTRUCTION NOTES

EXISTING

1. 3 EA. – 4"ø ELEC. CONDUITS, AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM PULL BOX BY PUMP HOUSE TO WELL #9 WITH PULL TAPE. PULL BOXES PROVIDED EVERY 500–FT (MAX.).
2. 1 EA. – 3"ø ELEC. CONDUIT AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM WELL #10 LOCAL DISCONNECT TO WELL #10 WITH PULL TAPE.
3. 1 EA. – 4"ø ELEC. CONDUIT AND 1 EA. – 1"ø COMMUNICATION CONDUIT (PRESSURE TRANSDUCER) EXTENDING FROM PULL BOX BY PUMP HOUSE TO FUTURE WELL #11 LOCATION WITH PULL TAPE. PULL BOXES PROVIDED EVERY 500–FT (MAX.).
4. VALVE VAULT INSTALLED AS PART OF THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT
5. BLOW–OFF HYDRANT INSTALLED AS PART OF THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT.
6. EXISTING WELL WATER SUPPLY AND TRANSMISSION MAINS (4 EA.) EXTENDING THROUGH PUMP HOUSE FLOOR. SEE DETAIL A/P1.1.
7. EXISTING WELL WATER SUPPLY LINES (10"ø AND 20"ø HDPE) AND ASSOCIATED CHEMICAL LINES (2 EA. – CHLORINE & ORTHOPHOSPHATE) BURIED IN THE SAME TRENCH FROM THE HSR PUMP HOUSE TO WELL #9 CHEMICAL INJECTION VAULT, WELL #10, OR FUTURE WELL #11 LOCATION.
8. CONNECTION OF HSR PUMP HOUSE SUPPLY TO EXISTING ToJ WATER SYSTEM DISTRIBUTION.
9. FIRE HYDRANT INSTALLED AS PART OF THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT.
10. EXISTING CULVERT AND ROUGHED–IN ACCESS DRIVE INSTALLED AS PART OF THE 2024 WEST JACKSON WATER TRANSMISSION PROJECT.
11. LVE SWITCH CABINET AND VAULT, SERVICE TO NEW PUMP HOUSE AND NORTH SOUTH PARK DEVELOPMENT

WORK UNDER THIS PROJECT

1. COMPLETE WELL #9 IN ACCORDANCE WITH SHEET P1.4.
2. COMPLETE WELL #10 IN ACCORDANCE WITH SHEET P1.4.
3. INSTALL MEYERS POWER PEDESTAL WITH INTEGRAL WELL DISCONNECT PER ELECTRICAL PLANS.
4. INSTALL BURIED POWER AND DATA CONDUITS FROM PULL/SPLICE BOXES (WELLS #9 & #11), OR DISCONNECT (WELL #10), TO PUMP HOUSE TERMINATION. PULL AND CONNECT POWER CONDUCTORS AND PRESSURE TRANSDUCER CABLE FROM HSR PUMP HOUSE TO EXISTING WELLS; 1860±LF FOR WELL #9 AND 60± L.F. FOR WELL #10. COMPLY WITH CONDUIT & CONDUCTOR REQUIREMENTS IN ELECTRICAL PLANS.
5. CONNECT SUMP PUMP TO EXISTING DRAIN LINE, SEE P1.0 & DETAIL C/P1.3.
6. Add. #1 COORDINATE INSTALLATION OF BUILDING ELECTRICAL SERVICE AND TRANSFORMER (INCLUDING CONCRETE PAD) WITH UTILITY PROVIDER LOWER VALLEY ENERGY (LVE) AND OWNER/ENGINEER. COMPLY WITH REQUIREMENTS AND STANDARD DETAILS PROVIDED IN THE MOST CURRENT VERSION OF LVE'S "ELECTRIC AND NATURAL GAS SERVICE REQUIREMENTS." ALL CONSTRUCTION ITEMS ALLOWED BY LVE TO BE FURNISHED AND INSTALLED BY A "QUALIFIED INSTALLATER", SHALL BE INSTALLED BY CONTRACTOR. CONTRACTOR SHALL PROVIDE ALL LABOR, EQUIPMENT, EXCAVATION, CONDUIT, BEDDING, BACKFILL AND CONCRETE TO INSTALL PRIMARY AND SECONDARY POWER SERVICE LINES AND THE TRANSFORMER PAD. ALL BURIED FACILITIES SHALL BE INSPECTED BY LVE AND ENGINEER PRIOR TO BACKFILL. COSTS FOR EQUIPMENT (TRANSFORMER, ETC.), LABOR AND SERVICE FEES BY LVE SHALL BE PAID FOR BY OWNER.
7. PUMP HOUSE PAVED DRIVEWAY AND PARKING, COMPLETE PER SHEET C1.2
8. INSTALL TEMPORARY FENCING WITHIN OR AT UTILITY EASEMENT AND AT PROPERTY LINE BOUNDARIES IN ACCORDANCE WITH NOTE 6 ON SHEET T1.0.
9. INSTALL FENCE AT EASEMENT LINE AND LOCATIONS SHOWN IN PLAN. SEE DETAIL 2/C2.1
10. TIE INTO EXISTING FENCE AND INSTALL H–BRACE ASSEMBLY PER DETAIL 2/C2.1
11. 8"ø GATE POST WITH COUNTRYLINE POWDER–COATED 10–FT HEAVY–DUTY TUBE GATE, OR EQUAL.
12. CONSTRUCT DRY WELL AT PROPERTY LINE PER DETAIL 5/C2.1. PROVIDED THE PROXIMITY TO THE WELL, NO CLEANING AGENTS OTHER THAN CHLORINE ARE ALLOWED IN THE CHLORINE ROOM. IF FUTURE MEANS OF POTABLE WATER DISINFECTION CHANGE FROM CHLORINE GAS TO ALTERNATIVE PROCESS, THE DRAIN SHALL BE EXPOSED AND CONNECTED TO THE EXTERIOR MANHOLE LIFT STATION LOCATED EAST OF THE PUMP/WELL HOUSE.
13. INSTALL TRAFFIC RATED BELOW GRADE ELECTRICAL SPLICE/PULL BOX.

GENERAL

1. **COMPLY WITH CONSTRUCTION NOTES ON SHEET T1.0 AND FINAL SITE GRADING AND SURFACE IMPROVEMENT REQUIREMENTS ON SHEET C1.2.**
2. ALL BURIED FACILITIES AND PIPE SHALL BE INSPECTED BY ENGINEER PRIOR TO BACKFILL.
3. STRIPPED MATERIAL SHALL BE STOCKPILED AT STOCKPILE AREAS SHOWN ON PLAN, CUT MATERIAL WILL BE PLACED DIRECTLY INTO FILL AREAS OR STOCKPILED. COMPLY WITH NOTES ON SHEET C1.0 AND PLAN ABOVE REGARDING APPROVED LOCATIONS FOR STOCKPILING, STAGING AND CONSTRUCTION.
4. IN LANDSCAPING AREAS SCHEDULE FOR DISTURBANCE, TOPSOIL SHALL BE STRIPPED TO A MINIMUM DEPTH OF 6–INCHES AND STOCKPILED SEPARATELY FOR REUSED TO COVER FINISH SLOPES. IMPORT ADDITIONAL WEED–FREE TOPSOIL IF NECESSARY TO COVER ALL DISTURBED AREAS NOT RECEIVING SURFACING. LEAVE SUBGRADE DOWN 4" TO 6" BELOW EXISTING GRADES IN AREAS RECEIVING TOPSOIL.
5. DUST CONTROL MUST BE ACCOMPLISHED BY WATERING STOCKPILES AND DRY SOILS AREAS DISTURBED BY PROJECT CONSTRUCTION.
6. CONTRACTOR SHALL PREVENT TRACKING OF SOIL ONTO THE ROAD AND CLEAN ROAD OF SOILS WHEN NECESSARY.
7. INSTALL EROSION CONTROL MEASURES TO PREVENT MIGRATION OF SOILS/SEDIMENT FROM THE PROJECT SITE. MAINTAIN THE DEVICES THROUGHOUT PROJECT CONSTRUCTION. ENGINEER/OWNER MAY REQUEST IMPLEMENTATION OF EROSION CONTROL DEVICES INCLUDING SMALL SWALES, BERMS, SEDIMENT LOGS AND SILT FENCE TO DIVERT WATER FROM CONSTRUCTION AND PREVENT MIGRATION OF SOILS FROM THE SITE. WHERE PROVIDED, EROSION CONTROL DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH DETAILS PROVIDED IN THESE PLANS.
8. REVEGETATION SHALL BE NATIVE SEED (HYDROSEED) AND SOD AND SHALL BE IRRIGATED BY OWNER WHEN NECESSARY.
9. CONTRACTOR MUST HAVE A WEED CONTROL PLAN PREPARED BY TETON COUNTY WEED AND PEST OR OTHER WEED SPECIALIST AND IMPLEMENT THE PLAN THROUGHOUT CONSTRUCTION. SEE NOTES ON THIS SHEET FOR WEED MANAGEMENT REQUIREMENTS. SEE REQUIREMENTS ON SHEET C1.2.
10. LAND DISTURBING ACTIVITIES SHALL OCCUR FROM SUMMER 2025 THROUGH FALL 2026, OR AS LIMITED BY THE CONTRACT SCHEDULE.
11. REFERENCE GEOTECHNICAL REPORT 23–302–02, DECEMBER 2024. CONTRACTOR SHALL FOLLOW RECOMMENDATIONS FOR FOUNDATION SOILS PREPARATION, FOUNDATION DRAIN PLACEMENT, FOUNDATION BACKFILL, DRIVEWAY CONSTRUCTION, AND OTHER SOIL PREPARATION FOR SLABS AND UTILITIES.

DATE	01/08/2025	REV.
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733–2087

DRAWING TITLE: HSR PUMP HOUSE SITE PLAN

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: C1.1

JOB NO: 23–302–02

S:\Proj\2023\302-02 troy high school rd water supply facilities\4 drawings\Civil\HSR Well House Site Plan.dwg HSR PUMP HOUSE SITE PLAN - Aug 29 2025 02:07:38 pm PLOTTED BY bjgarlock DWG TRUE:1 ZSA

WINDOW SCHEDULE:

Mark	Manufacturer	Model	Unit Size		Head Height	Count	Comments
			Width	Height			
A	T.B.D.	Standard Fixed Window Unit	3' - 0"	1' - 8"	8' - 0"	6	
B	T.B.D.	Standard Fixed Window Unit	3' - 0"	3' - 0"	6' - 8"	1	60-MINUTE FIRE RATED, ASTM E119 or UL 263 LISTED, SHATTER-RESISTANT GLASS

Add. #1

WINDOW NOTES:

1. ALL WINDOWS BRAND TO BE DETERMINED
2. ALL WINDOWS TO BE .30 U-FACTOR OR BETTER
3. EXTERIOR FINISH COLOR SELECTED BY OWNER
4. INTERIOR FINISH WOOD SELECTED BY OWNER
5. INTERIOR TRIM TO BE PAINTED WOOD - FINISH SELECTED BY OWNER - SEE DETAILS
6. HARDWARE FINISH SELECTED BY OWNER
7. GC TO PROVIDE SAMPLE TO CONFIRM COLOR SELECTION. SEE EXTERIOR ELEVATIONS FOR OPERATION.
8. ALL WINDOWS TO BE MANUFACTURED FOR HIGH ALTITUDE USE.
9. VERIFY ALL EGRESS WINDOWS.
10. VERIFY ALL TEMPERED WINDOWS -
    -ALL WINDOWS LOCATED WITHIN 24" HORIZONTALLY OF DOORS AND LESS THAN 60" AFF.
    -ALL WINDOWS WITH NET GLAZING AREA THAT IS GREATER THAN 9 SQUARE FEET AND ARE LESS THAN 18" AFF UNLESS UNINTERRUPTED BY STRUCTURAL HORIZONTAL MEMBERS FROM 34" TO 38" AFF.
    -IN ALL TUB AND SHOWER ENCLOSURES.
    -IN ANY WINDOW LOCATED AT A STAIRWAY LANDING ENCLOSURE AND ANY WINDOW LOCATED WITHIN 60" OF THE TOP OR BOTTOM OF A STAIRWAY IF THE BOTTOM OF THE GLAZING IS LESS THAN 36" AFF.
    -IN ALL DOORS.
    -GLAZING WITHIN 24" OF THE HINGE-SIDE OF AN IN-SWINGING DOOR.
    -GLAZING IN WALLS, ENCLOSURES OR FENCES CONTAINING OR ADJACENT TO BATHTUBS OR SHOWERS WHERE THE BOTTOM EDGE OF THE GLAZING IS LESS THAN 60" ABOVE THE STANDING OR WALKING SURFACE.

DOOR SCHEDULE:

Door Number	Width	Height	Door Type	Function	Hardware Group	Comments
001	9' - 0"	9' - 10"	THERMISER® INSULATED ROLLING DOOR	Exterior		
002	3' - 0"	6' - 8"	HOLLOW METAL DOOR	Exterior	A	WITH WINDOW
003	3' - 0"	6' - 8"	HOLLOW METAL DOOR	Exterior	A	WITH WINDOW
004	7' - 0"	9' - 10"	THERMISER® INSULATED ROLLING DOOR	Exterior		
005	2' - 10"	6' - 8"	HOLLOW METAL DOOR	Interior	B	WITH WINDOW
006	10' - 0"	9' - 10"	THERMISER® INSULATED ROLLING DOOR	Exterior		WITH 3 ROWS OF VISION WINDOWS

DOOR NOTES:

1. ALL DOORS TO BE .30 U-FACTOR OR BETTER
2. EXTERIOR ENTRY DOORS TO BE SAME BRAND/SERIES AS WINDOWS.
3. DOOR HARDWARE IN ACCORDANCE WITH SPEC SECTION 08 71 00
4. LEVER HANDLE, HINGES, AND DOOR STOP MATERIAL IN ACCORDANCE WITH SPEC SECTION 08 71 00
5. ALL CLOSET DOORS TO BE 1 3/8" THICK, SOLID CORE, BIRCH VENEER, FLAT PANEL.
6. VERIFY ALL TEMPERED GLASS.

DOOR HARDWARE LEGEND:

TYPE A
PULL SIDE - LEVER WITH KEYED LOCK
PUSH SIDE - PANIC BAR w/ CONCEALED VERTICAL ROD

TYPE B
PULL SIDE - PASSAGE LEVER
PUSH SIDE - PANIC BAR w/ CONCEALED VERTICAL ROD

REVISIONS

#	DATE
1	07-29-25

Drawing Title
SCHEDULES

Date
2025.09.05

Mechanical:
Energy 1
David Magill
520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

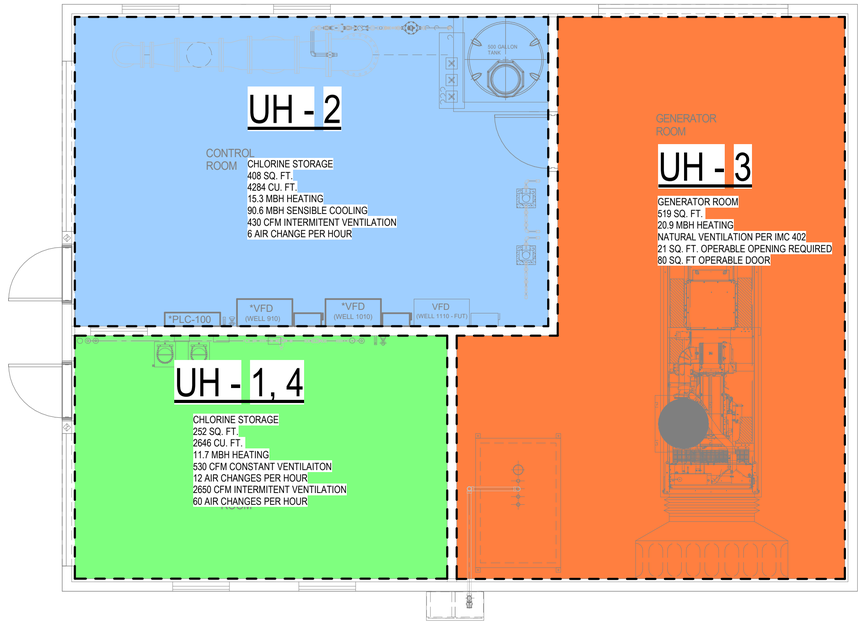
Structural:
Nelson Engineering
Carla Hansen
4424 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
ToJ HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Atelier 43, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

G1.1



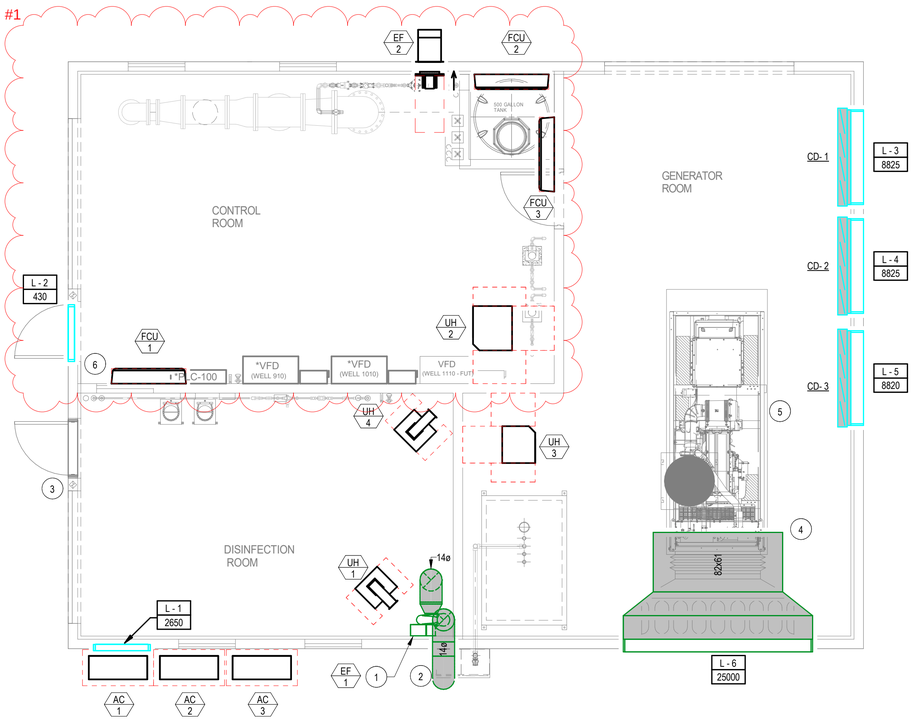
2 M1.0 MAIN LEVEL FORCED AIR ZONING PLAN

SCALE: 1/4" = 1'-0"

Add. #1

KEYED NOTES

1. PROVIDE INTAKE WITH ALUMINUM BIRD SCREEN. FAN TO BE MOUNTED ON WALL. INTAKE TERMINATION TO BE WITHIN 12" OF FLOOR. INTAKE DUCTING TO BE PVC.
2. EXHAUST TO BE TURNED DOWN ON EXTERIOR OF BUILDING. PROVIDE WITH ALUMINUM BIRDSCREEN. DUCTING TO BE PVC.
3. PROVIDE 30 MINUTE TIMER SWITCH FOR EF-1 AND WEATHERPROOF ENCLOSURE NEXT ON EXTERIOR WALL NEAR DOOR.
4. PROVIDE DUCTING AND FLEXIBLE DUCT CONNECTOR TO ATTACH TO RADIATOR.
5. PROVIDE GENERATOR WITH DOUBLE WALL INSULATED VENT PIPE, SELKIRK OR SIMILAR. PROVIDE WITH VENTILATED ROOF THIMBLE, INLINE DRAIN, FLIP TOP TERMINATION, EXPANSION JOINT AND PRESSURE RELIEF VALVE.
6. EF-1 CONTROLS TO BE LOCATED IN CONTROL ROOM, OUTSIDE OF CORROSIVE ENVIROMENT.



1 M1.0 MAIN LEVEL FORCED AIR PLAN

SCALE: 1/4" = 1'-0"

Revisions			
#	Description	Date	
1	PERMIT REVISIONS	4/10/25	
2	MECH REVISION	08/28/25	

Drawing Title
MAIN LEVEL FORCED AIR PLAN

Date
2025.04.16

Mechanical:
Engineer
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

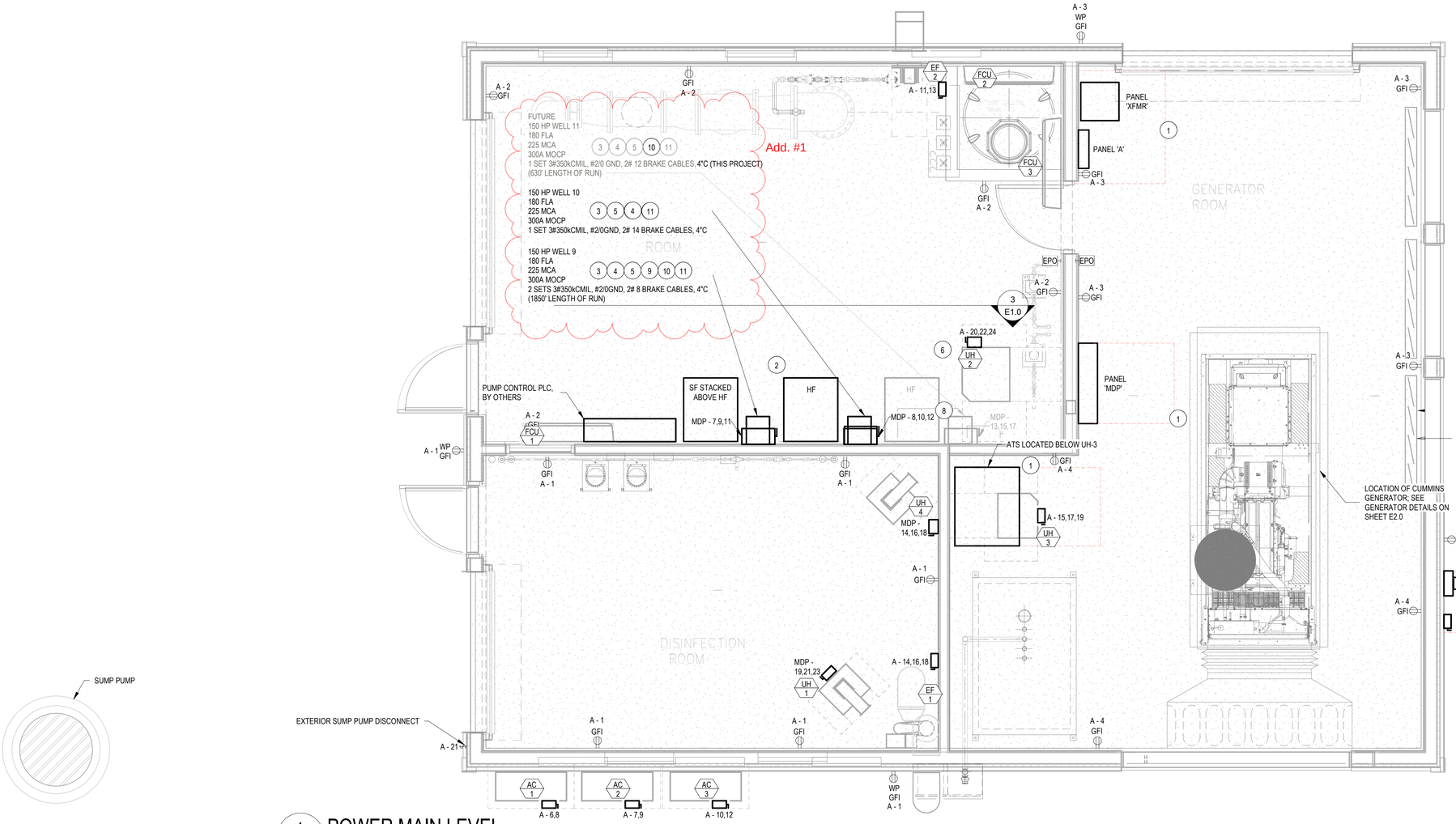
Client:
TOWN OF JACKSON

Project:
TOWN HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Alle Jae S, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

Professional Engineer ADAM HANSEN 14811 Date WYOMING
09/02/2025

M1.0



1 E1.0 POWER MAIN LEVEL
SCALE: 3/8" = 1'-0"

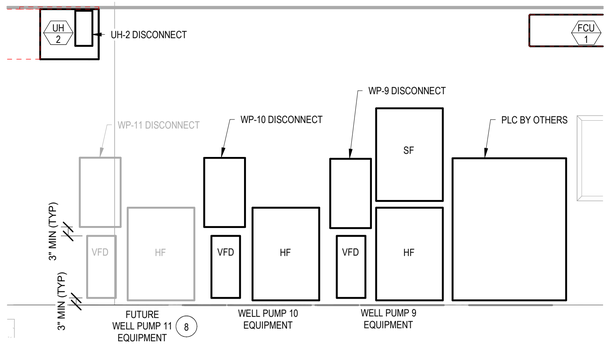
GENERAL ELECTRICAL NOTES:

A. IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INVOLVED TO COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, DIFFUSERS, BOXES, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.
B. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING OF FLOORS, WALLS, CEILINGS, AND ROOFS TO PERFORM THE REQUIRED WORK DEPICTED IN THESE DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR ALL PATCHING OF HOLES TO THE SATISFACTION OF THE ARCHITECT/ENGINEER.
C. CONTRACTOR IS FULLY RESPONSIBLE FOR FOLLOWING ALL APPLICABLE CODES AND STANDARDS, AS WELL AS ALL LOCAL ADDENDUM TO THOSE CODES AND STANDARDS, WHETHER SPECIFICALLY SHOWN ON THESE DRAWINGS OR NOT.

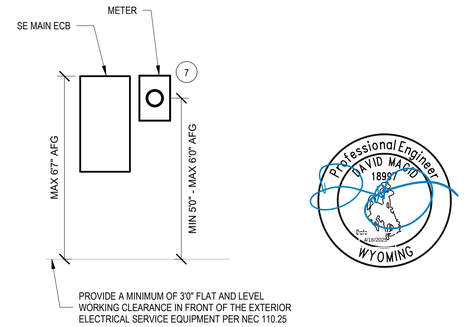
KEYED NOTES (#)

Add. #1

1 MAINTAIN WORKING CLEARANCE IN ACCORDANCE WITH NEC 110.26.
2 INSTALL VFD SUPPLIED BY OWNER. MAKE/MODEL: ROCKWELL AUTOMATION, POWER FLEX PF750-FRAM-6-TYPE1
3 ALL DISCONNECTS ON THE LOAD SIDE OF THE VFD SHALL BE PROVIDED WITH BRAKE CABLE CONTACTS. THE PAIR OF BRAKE CABLES ARE TO LANDED ON THE APPROPRIATE CONTACTS IN THE VFD COMMUNICATING THE DOWNSTREAM DISCONNECT IS IN THE OPEN POSITION.
4 ALL WIRING ON THE LOAD SIDE OF VFD TO MOTOR SHALL BE SHIELDED, TWISTED, VFD RATED CABLING REFER TO ONE-LINE DIAGRAM FOR SIZE AND CABLING QUANTITIES.
5 INSTALL HARMONIC FILTER SUPPLIED BY OWNER. MAKE/MODEL: TCI HSD0200AW11020.
6 MAINTAIN WORKING CLEARANCE IN ACCORDANCE WITH NEC 110.26 FOR ALL DISCONNECTS LOCATED AT EQUIPMENT. (TYP)
7 METER WILL BE MOUNTED ON THE TRANSFORMER. COORDINATE WITH CIVIL FOR TRANSFORMER LOCATION.
8 LOCATION FOR FUTURE WELL 11 EQUIPMENT.
9 INSTALL SINEWAVE FILTER SUPPLIED BY OWNER. MAKE/MODEL: TCI KMG250A01A
10 INSTALL EXTERIOR BURIED TIER 22 PULL/SPLICE BOXES, BURIED CONDUITS AND CONDUCTORS IN ACCORDANCE WITH C1.1 SIZE OF PULL BOXES AND CONDUCTORS SHALL BE IN ACCORDANCE WITH NEC. CONDUIT INSTALLATION FROM PUMP HOUSE TO THE PULL BOX FOR WELL 11 IS REQUIRED, HOWEVER WELL 11 IS A FUTURE INSTALLATION (WORK) WHERE FURNISHING AND INSTALLING THE CONDUCTOR IS NOT REQUIRED FOR THIS PROJECT.
11 VFD CABLING REFER TO E3.0 FOR CABLING PRODUCT MAKE AND MODEL.



3 E1.0 INTERIOR ELECTRICAL EQUIPMENT
SCALE: 3/8" = 1'-0"



2 E1.0 EXTERIOR SERVICE EQUIPMENT
SCALE: 3/8" = 1'-0"

Revisions

#	Description	Date
1	PERMIT REVISIONS	4/10/25
3	ADDENDUM #1	9/18/25

Drawing Title
POWER MAIN LEVEL

Date
2025.04.16

Mechanical:
Engineer
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carla Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TOWN SCHOOL ROAD
PUMP HOUSE

Architect:
Allied ARCHITECTS, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

Professional Engineer
DAVID MAGID
18997
WYOMING

E1.0

GENERAL NOTES

A. CONDUIT, CONDUCTORS AND AIC CALCULATIONS FOR ALL SERVICE, PANEL AND EQUIPMENT FEEDERS INDICATED ON THE ONE-LINE HAVE BEEN SIZED BASED ON COPPER.

B. INSTALLATION PER UTILTIY REQUIREMENTS

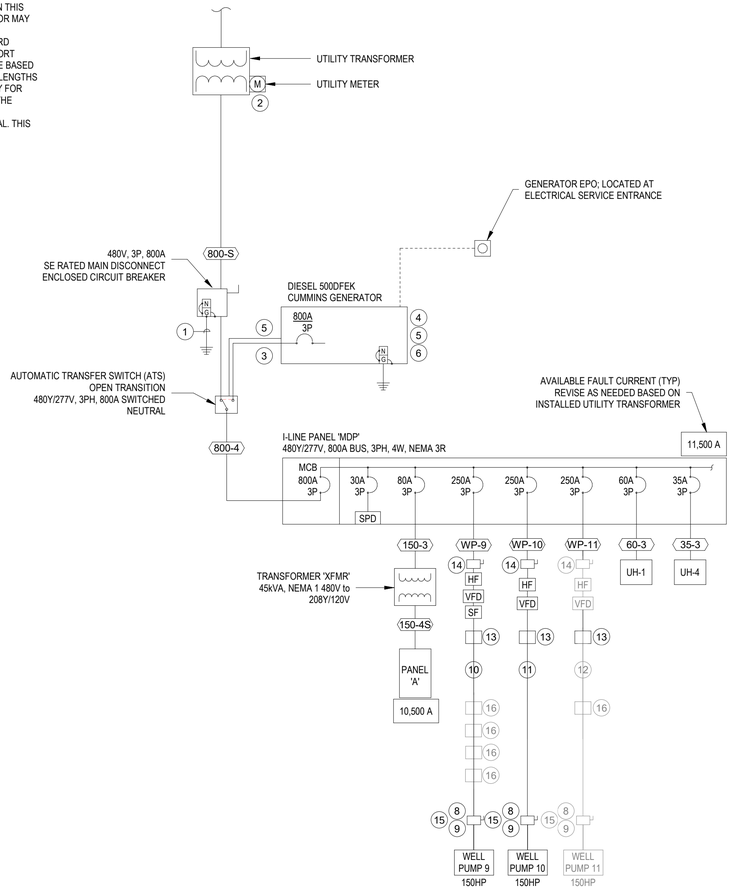
C. COORDINATE EXACT DISTANCES BETWEEN UTILITY TRANSFORMER AND METER/CT WITH LOCAL UTILITY PRIOR TO ROUGH-IN.

D. BASED ON ACTUAL HOMERUN LENGTHS REQUIRED IN THE FIELD, THE CONTRACTOR IS RESPONSIBLE TO CALCULATE AND INCREASE THE WIRE SIZES AS REQUIRED TO LIMIT BRANCH CIRCUIT VOLTAGE DROP TO 3% OR LESS. FOR 20A BRANCH CIRCUITS THE MINIMUM CONDUCTOR SIZES SHALL BE AS FOLLOWS: #10 AMG CU FOR RUNS BETWEEN 100 AND 200 LINEAR FEET, #8 AWG CU FOR RUNS BETWEEN 200 AND 325 LINEAR FEET, AND AS CALCULATED BY THE CONTRACTOR FOR CIRCUITS EXTENDING BEYOND 325 LINEAR FEET. IN ALL CASES WHERE WIRE SIZES INCREASE, THE CONTRACTOR SHALL PROVIDE LARGER CONDUITS AS REQUIRED.

E. AVAILABLE FAULT CURRENT (AFC) VALUES SHOWN ON THIS DRAWING ARE DESIGN ESTIMATES ONLY. CONTRACTOR MAY SOLICIT THE SERVICES OF EITHER THE ELECTRICAL EQUIPMENT VENDOR, OR AN ENGINEER APPROVED 3RD PARTY, TO PERFORM THE CODE REQUIRED FINAL SHORT CIRCUIT, FAULT CURRENT, STUDIES WHICH ARE TO BE BASED ON CONTRACTOR PROVIDED INFORMATION OF WIRE LENGTHS AND MATERIAL. CONTRACTOR SHALL USE THIS STUDY FOR THE PURCHASE OF EQUIPMENT, AND SHALL SUBMIT THE STUDY RESULTS WITH THE ELECTRICAL EQUIPMENT SUBMITTAL FOR ENGINEERING REVIEW AND APPROVAL. THIS STUDY IS FOR COMPLIANCE WITH NEC 408.6.

KEYED NOTES (#)

1. REFER TO DETAIL #2 ON THIS SHEET (E2.0) FOR GROUNDING REQUIREMENTS.
2. CONFIRM ALL REQUIREMENTS WITH LOCAL ELECTRICAL UTILITY FOR TRANSFORMER PADS, CONDUITS, AND INSTALL LOCATIONS PRIOR TO START OF WORK.
3. PROVIDE 'ATS' WITH 4-POLE, SOLID NEUTRAL OPEN TRANSITION.
4. COORDINATE GENERATOR EPO LOCATION WITH AHJ.
5. PROVIDE AND TERMINATE ALL NECESSARY WIRING FOR CONTROLS AND COMMUNICATION BETWEEN GENERATOR AND ATS IN SEPERATE CONDUIT. COORDINATE WITH GENERATOR/ATS VENDOR.
6. REFER TO GENERATOR PAD DETAIL #3 ON SHEET E2.0 FOR GROUNDING.
7. PROVIDE POWER FOR GENERATOR BATTERY CHARGER AND BLOCK HEATER.
8. DISCONNECT TO BE PROVIDED WITH BREAK CABLE CONTACTS.
9. ALL WIRING TO THE MOTORS TO BE SHIELDED VFD AND TWISTED CABLES.
10. WIRING FROM EXTERIOR PULL BOX AT PUMP HOUSE TO PULL BOX AT WELL PUMP SHALL BE VFD RATED CABLE (BELDEN 29534 OR APPROVED EQUIVALENT). CABLE SHALL BE SHIELDED, XLPE INSLUATED, 600V RATED, SUITABLE FOR DIRECT BURIAL/CONDUIT INSTALLATION. ELECTRICAL CONTRACTOR SHALL PROVIDE (2) SETS OF PARALLEL VFD FEEDERS PER PHASE FOR WELL PUMP 9. CONTRACTOR SHALL ALSO PROVIDE (1) #2/0 CU EQUIPMENT GROUND PER CONDUIT SIZED IN ACCORDANCE WITH NEC TABLE 250.122 FOR A 300A OCPD. CONTRACTOR SHALL INSTALL VFD BRAKE RESISTOR CABLES (SIZE AND QUANITITY PER MANUFACTURER'S REQUIREMENTS) IN SAME CONDUIT AS FEEDERS UNLESS OTHERWISE SPECIFIED BY VFD MANUFACTURER. ALL MOTOR AND VFD CONNECTIONS SHALL BE MADE WITH LISTED SPLICE KITS OR TERMINATION KITS, WITH FLEXIBLE PIGTAILS PROIVDED AS NEEDED FOR FINAL CONNECTION TO MOTOR AND VFD TERMINALS.
11. WIRING FROM EXTERIOR PULL BOX AT PUMP HOUSE TO PULL BOX AT WELL PUMP SHALL BE VFD RATED CABLE (BELDEN 29534 OR APPROVED EQUIVALENT). CABLE SHALL BE SHIELDED, XLPE INSULATED, 600V RATED, SUITABLE FOR DIRECT BURIAL/CONDUIT INSTALLATION. ELECTRICAL CONTRACTOR SHALL PROVIDE (1) SET OF VFD FEEDERS PER PHASE FOR WELL PUMP 10. CONTRACTOR SHALL ALSO PROVIDE (1) #2/0 CU EQUIPMENT GROUND PER CONDUIT SIZED IN ACCORDANCE WITH NEC TABLE 250.122 FOR A 300A OCPD. CONTRACTOR SHALL INSTALL VFD BRAKE RESISTOR CABLES (SIZE AND QUANITITY PER MANUFACTURER'S REQUIREMENTS) IN SAME CONDUIT AS FEEDERS UNLESS OTHERWISE SPECIFIED BY VFD MANUFACTURER. ALL MOTOR AND VFD CONNECTIONS SHALL BE MADE WITH LISTED SPLICE KITS OR TERMINATION KITS, WITH FLEXIBLE PIGTAILS PROIVDED AS NEEDED FOR FINAL CONNECTION TO MOTOR AND VFD TERMINALS.
12. WIRING FROM EXTERIOR PULL BOX AT PUMP HOUSE TO PULL BOX AT WELL PUMP SHALL BE VFD RATED CABLE (BELDEN 29534 OR APPROVED EQUIVALENT). CABLE SHALL BE SHIELDED, XLPE INSLUATED, 600V RATED, SUITABLE FOR DIRECT BURIAL/CONDUIT INSTALLATION. ELECTRICAL CONTRACTOR SHALL PROVIDE (1) SET OF VFD FEEDERS PER PHASE FOR WELL PUMP 11. CONTRACTOR SHALL ALSO PROVIDE (1) #2/0 CU EQUIPMENT GROUND PER CONDUIT SIZED IN ACCORDANCE WITH NEC TABLE 250.122 FOR A 300A OCPD. CONTRACTOR SHALL INSTALL VFD BRAKE RESISTOR CABLES (SIZE AND QUANITITY PER MANUFACTURER'S REQUIREMENTS) IN SAME CONDUIT AS FEEDERS UNLESS OTHERWISE SPECIFIED BY VFD MANUFACTURER. ALL MOTOR AND VFD CONNECTIONS SHALL BE MADE WITH LISTED SPLICE KITS OR TERMINATION KITS, WITH FLEXIBLE PIGTAILS PROIVDED AS NEEDED FOR FINAL CONNECTION TO MOTOR AND VFD TERMINALS. WELL PUMP 11 AND CONDUCTORS TO BE INSTALLED IN FUTURE PHASE.
13. EXTERIOR TEIR 22 BURIED PULL/SPLICE BOX REFER TO CIVIL SITE PLANS FOR LOCATION.
14. MOTOR RATED BREAK SWITCH - "SQUARE D, MOTOR PROTECTOR POWER PACK J, 300A JJL36300M75 OR APPROVED EQUIVALENT.
15. FRAME MOUNTED NEMA 3R 300A MOTOR RATED DISCONNECT.
16. EXISTING IN-FIELD PULL BOXES SPACED AT <500 L.F.



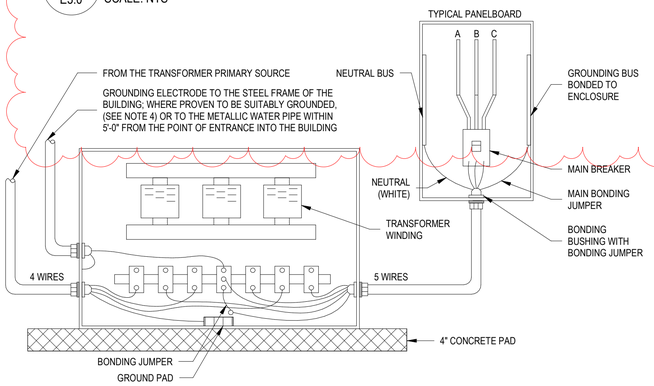
3-PHASE FEEDER SCHEDULE

AMPS-WIRE QTY PER CONDUIT	75 DEG COPPER						75 DEG ALUMINUM					
	SETS IN PARALLEL	CONDUIT	POLE QTY AND AWG	NEUTRAL AWG	GROUND AWG (*2)	SBJ	SETS IN PARALLEL	CONDUIT	POLE QTY AND AWG	NEUTRAL AWG	GROUND AWG (*2)	SBJ
20-4	1	3/4"	3#12	1#12	1#12	1#8	-	-	-	-	-	-
30-3	1	3/4"	3#10	-	1#10	1#8	-	-	-	-	-	-
30-4	1	3/4"	3#10	1#10	1#10	1#8	-	-	-	-	-	-
50-3	1	1"	3#8	-	1#10	1#8	-	-	-	-	-	-
50-4	1	1"	3#8	1#8	1#10	1#8	-	-	-	-	-	-
60-3	1	1-1/4"	3#6	-	1#10	1#8	-	-	-	-	-	-
60-4	1	1-1/4"	3#6	1#6	1#10	1#8	-	-	-	-	-	-
70-3	1	1-1/4"	3#4	-	1#8	1#8	-	-	-	-	-	-
70-4	1	1-1/4"	3#4	1#4	1#8	1#8	-	-	-	-	-	-
90-3	1	1-1/4"	3#3	-	1#8	1#8	-	-	-	-	-	-
90-4	1	1-1/4"	3#3	1#3	1#8	1#8	-	-	-	-	-	-
100-3	1	1-1/4"	3#2	-	1#8	1#6	1	1-1/2"	3#1	-	1#6	1#6
100-4	1	1-1/2"	3#2	1#2	1#8	1#6	1	1-1/2"	3#1	1#1	1#6	1#6
125-3	1	1-1/2"	3#1	-	1#6	1#6	1	2"	3#2/0	-	1#4	1#4
125-4	1	1-1/2"	3#1	1#1	1#6	1#6	1	2"	3#2/0	1#2/0	1#4	1#4
150-3	1	2"	3#1/0	-	1#6	1#6	1	2-1/2"	3#3/0	-	1#4	1#4
150-4	1	2"	3#1/0	1#1/0	1#6	1#6	1	2-1/2"	3#3/0	1#3/0	1#4	1#4
150-4S	1	2"	3#1/0	1#1/0	1#6	1#6	1	2-1/2"	3#3/0	1#3/0	1#4	1#4
175-3	1	2"	3#2/0	-	1#6	1#4	1	2"	3#4/0	-	1#4	1#2
175-4	1	2"	3#2/0	1#2/0	1#6	1#4	1	2-1/2"	3#4/0	1#4/0	1#4	1#2
200-3	1	2"	3#3/0	-	1#6	1#4	1	2-1/2"	3#250	-	1#4	1#2
200-4	1	2-1/2"	3#3/0	1#3/0	1#6	1#4	1	3"	3#250	1#250	1#4	1#2
200-4S	1	2-1/2"	3#3/0	1#3/0	1#6	1#4	1	3"	3#250	1#250	1#4	1#2
225-3	1	2-1/2"	3#4/0	-	1#4	1#2	1	2-1/2"	3#300	-	1#2	1#1/0
225-4	1	2-1/2"	3#4/0	1#4/0	1#4	1#2	1	3"	3#300	1#300	1#2	1#1/0
250-3	1	2-1/2"	3#250	-	1#4	1#2	1	3"	3#350	-	1#2	1#1/0
250-4	1	2-1/2"	3#250	1#250	1#4	1#2	1	3"	3#350	1#350	1#2	1#1/0
300-3	1	3"	3#350	-	1#3	1#2	1	3"	3#500	-	1#2	1#1/0
300-4	1	3"	3#350	1#350	1#3	1#2	1	4"	3#500	1#500	1#2	1#1/0
WP-9	3	4"	3#350	2#8	1#2/0	1#2	2	4"	3#500	3#500	1#2	1#1/0
WP-10	1	4"	3#350	2#14	1#2/0	1#3	2	3"	3#350	3#350	1#2	1#1/0
WP-11	1	4"	3#350	2#12	1#2/0	1#2	2	4"	3#500	3#500	1#2	1#1/0
400-3	2	2"	3#3/0	-	1#3	1#1/0	2	2-1/2"	3#250	-	1#1	1#3/0
400-4	2	2-1/2"	3#3/0	1#3/0	1#3	1#1/0	2	2-1/2"	3#250	1#250	1#1	1#3/0
500-3	2	3"	3#250	-	1#2	1#1/0	2	3"	3#350	-	1#1/0	1#3/0
500-4	2	3"	3#250	1#250	1#2	1#1/0	2	3"	3#350	1#350	1#1/0	1#3/0
600-3	2	3"	3#350	-	1#1/0	1#2/0	2	3"	3#500	-	1#2/0	1#4/0
600-4	2	3"	3#350	1#350	1#1/0	1#2/0	2	4"	3#500	1#500	1#2/0	1#4/0
800-3	3	3"	3#300	-	1#1/0	1#3/0	3	3"	3#400	-	1#3/0	1#4/0
800-S	3	3"	3#300	1#300	-	1#3/0	3	3"	3#400	1#400	-	1#4/0
800-4	3	3"	3#300	1#300	1#1/0	1#3/0	3	4"	3#400	1#400	1#3/0	1#4/0
1000-3	3	3-1/2"	3#400	-	1#2/0	1#3/0	4	3"	3#500	-	1#4/0	1#4/0
1000-4	3	3-1/2"	3#400	1#400	1#2/0	1#3/0	4	3"	3#350	1#350	1#4/0	1#4/0
1200-3	4	3"	3#350	-	1#3/0	1#3/0	4	4"	3#500	-	1#250	1#250
1200-4	4	3"	3#350	1#350	1#3/0	1#3/0	4	4"	3#500	1#500	1#250	1#250
1600-4	5	4"	3#400	1#400	1#4/0	1#250	5	4"	3#400	1#400	1#350	1#500
2000-4	6	4"	3#400	1#400	1#250	1#300	7	4"	3#500	1#500	1#400	1#500
2600-4	7	4"	3#500	1#500	1#350	1#500	7	4"	3#750	1#750	1#600	1#750
3000-4	8	4"	3#500	1#500	1#400	1#500	8	4"	3#750	1#750	1#600	1#750
4100-4	11	4"	3#500	1#500	1#500	1#500	11	4"	3#750	1#750	1#800	1#750

FEEDER SCHEDULE NOTES:
1. CONDUCTORS SHOWN ARE SHOWN FOR EACH CONDUIT WITH MODIFICATIONS AS NOTED BELOW. ALL CONDUCTORS SHOWN ARE THWN UNLESS NOTED OTHERWISE.
2. MODIFY GROUNDING CONDUCTOR PROVIDED PER THE FOLLOWING:
   2A. PROVIDE EQUIPMENT GROUND CONDUCTOR PER TABLE 250-122 WHEN CIRCUIT BREAKER IS SIZED GREATER THAN AMPERE RATING SHOWN IN FEEDER TAG.
   2B. GROUNDING CONDUCTOR SHALL BE OMITTED BETWEEN THE UTILITY TRANSFORMER AND THE FIRST OVERCURRENT PROTECTION DEVICES WHERE GROUNDING IS DERIVED.
   2C. WHERE FEEDER TAG INCLUDES "FG", PROVIDE GROUNDING CONDUCTOR TO MATCH RESPECTIVE PHASE CONDUCTOR SIZE.
   2D. ON FEEDERS FROM THE SECONDARY SIDE OF A TRANSFORMER OR FEEDER TAGGED "SBJ", PROVIDE GROUND CONDUCTOR FROM SBJ COLUMN IN PLACE OF DEFAULT GROUND AWG.
3. PROVIDE A #10 OR SUPER NEUTRAL FOR 15A AND 20A BRANCH CIRCUITS SERVING MULTIPLE KNOWN COMPUTER LOADS. THESE INCLUDE BUT ARE NOT LIMITED TO DEVICES SERVING WORKSTATIONS, POS STATIONS, CUBICAL SYSTEMS FURNITURE, AND DESKS.
4. INFORMATION IN FEEDER SCHEDULE IS ASSOCIATED AND SIZED PER AMPERAGE REFERENCED IN FEEDER TAG. ALTERNATIVE CABLING NOT REQUIRED TO BE INSTALLED IN CONDUIT UNDER THE NEC OF EQUAL OR GREATER AMPERAGE RATING MAY BE INSTALLED WHERE PERMITTED BY LOCAL BUILDING CODES.

Add. #1

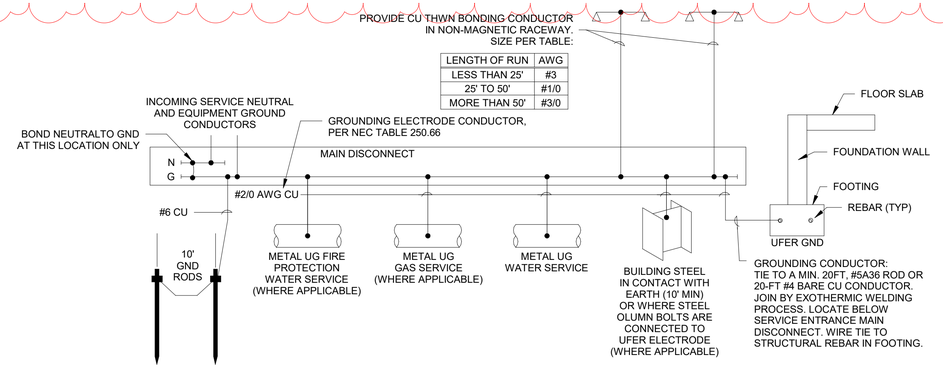
1 ELECTRICAL ONE-LINE DIAGRAM
E3.0 SCALE: NTS



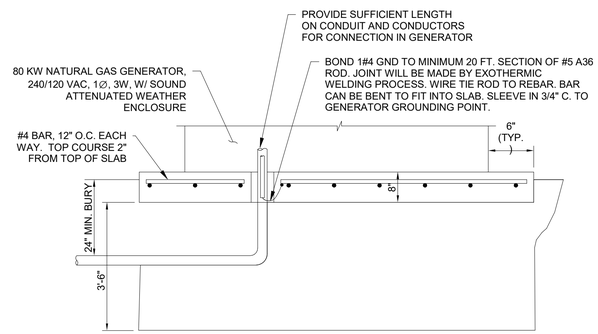
GENERAL NOTES

1. TRANSFORMER BONDING STRAP. IF NOT PROVIDED BY THE TRANSFORMER MANUFACTURER THIS STRAP SHOULD BE THE SAME SIZE AS THE MAIN BONDING JUMPER.
2. USE A BONDING BUSHING AND JUMPER AT THE CONDUIT TERMINATION. JUMPER SHOULD BE THE SAME SIZE AS THE GROUNDING ELECTRODE CONDUCTOR CONTAINED IN THE CONDUIT.
3. USE A BONDING CLAMP AT THE TERMINATION OF THE GROUNDING ELECTRODE CONDUCTOR TO THE ELECTRODE.
4. SEE NEC 250.52(A)(2) FOR DEFINITION OF WHERE BUILDING STEEL IS SUITABLE TO SERVE AS A GROUNDING ELECTRODE. PROVIDE NECESSARY BONDS FROM STEEL ANCHOR BOLTS TO ENCASED ELECTRODE.

4 TRANSFORMER CONNECTION DETAIL
E3.0 SCALE: NTS



2 GROUNDING AND BONDING RISER DIAGRAM
E3.0 SCALE: NTS



3 GENERATOR PAD DETAIL
E3.0 SCALE: NTS

#	Description	Date
1	PERMIT REVISIONS	4/10/25
3	ADDENDUM #1	9/18/25

Drawing Title
ONE LINE DIAGRAM

Date
2025.04.16

Mechanical:
Eagle Mountain Engineering
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Carls Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
POWELL SCHOOL ROAD
PUMP HOUSE

Architect:
Alta 43, LLC
mail PO Box 4055 Jackson, WY 83001
office 610 W Broadway Ave #103 Jackson, WY 83001
phone 307.249.8650

E3.0

J. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

2.2 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
B. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. Schneider Electric USA (Square D).
Add. #1 3. Siemens
   4. ABB Technologies
B. Panelboards: NEMA PB 1, distribution type.
C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
   1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
D. Mains: Circuit breaker.
E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.
G. Branch Overcurrent Protective Devices: Fused switches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton.
   2. Schneider Electric USA (Square D).
   3. Siemens Industry, Inc., Energy Management Division.
B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
C. Mains: Circuit breaker.
D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
F. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692-94a, sound; angular crushed stone, slag or gravel.

C. Fine Aggregate: ASTM D 1073-94, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Percent wear: ASTM C131-96, less than 45 for aggregates retained in #10 sieve.

E. Mineral Filler: ASTM D 242/D 242M rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

Add. #1 A. Asphalt Binder: AASHTO M 320, PG 58-34 or PG 58-28, performance graded asphalt binder with 0.5%anti-strip agent.
1. Binder shall conform to Section 804 – 'Asphalt Materials" of the 2010 Wyoming Department of Transportation Standard Specifications for Roads and Bridge Construction.
2. Alternate asphalt binder having a higher upper specification temperature and/or lower specification temperature will be acceptable provided the Contractor provides written notice to the Engineer prior to production.

B. Emulsified Asphalt Prime Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

C. Tack Coat: ASTM D 977-98 emulsified asphalt, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

D. Fog Seal: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, factory diluted in water, of suitable grade and consistency for application.
1. Use emulsions SS-1h or CSS-1H.

E. Water: Potable.

F. Undersealing Asphalt: ASTM D 3141/D 3141M; pumping consistency.

2025 HIGH SCHOOL ROAD
PUMP HOUSE

ToJ PROJECT # 26-06

ADDENDUM NO. 2

Sept. 23rd, 2025

NOTICE TO BIDDERS

This ADDENDUM shall be acknowledged on the BID FORM. Failure of any Bidder to properly acknowledge receipt of this Addendum both on this ADDENDUM and on the BID FORM may result in REJECTION OF THE BID.

This Addendum shall be attached to the Contract Documents and shall form a part thereof. The following changes, additions and/or deletions shall be made in the Specifications, Contract Documents and/or Drawings.

……

A complete package of the revised plans incorporating Addendum #1 can be downloaded at:

https://www.dropbox.com/scl/fi/q11osinpn98om3y1igggd/26-06-ToJ-HSR-Pump-House_ProjectManual_Bid-Set-Add.-1-2.pdf?rlkey=tsjg27u5g3ecdci5xm8y3wot9&st=pfxzjv5z&dl=0

Revisions for this addendum are noted with "Add.#2" within each attachment below.

1. **REVISE** the Bid Schedule per the attached.

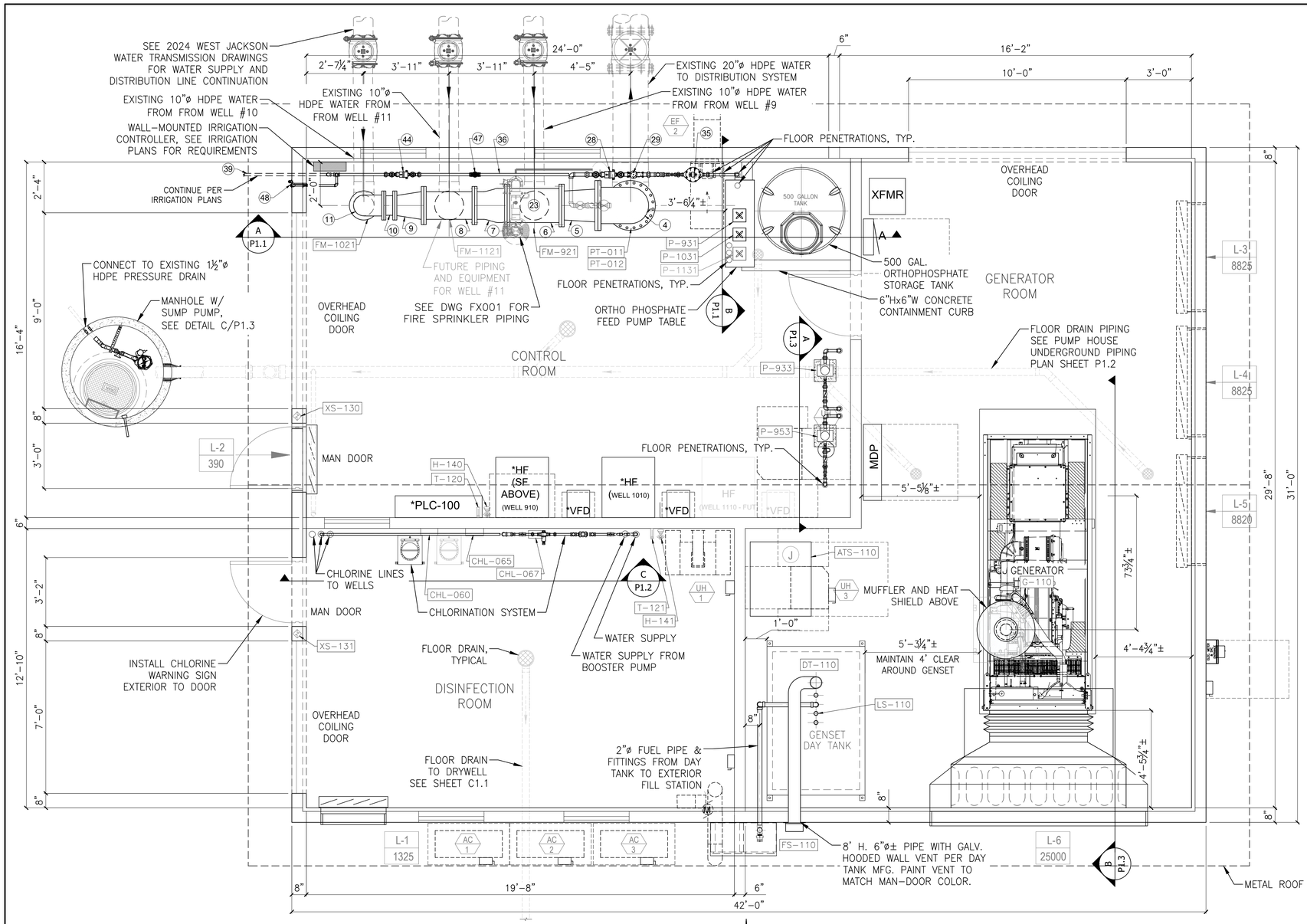
2. **REPLACE/REVISE** notes in drawings P1.0, P1.4, and E2.0 in accordance with the attached.

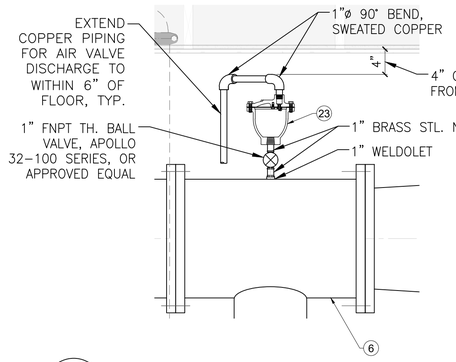
Sincerely,

Josh Kilpatrick, PE
Project Manager
****

ITEM	* Construction Item		Quantity	Unit	Unit Price	Total
8	Building & Site Electrical					
	8.01	Building Electrical Service (Transformer & Pad, CT, Meter, etc.)	LS	1		
	8.02	Building Electrical, Panels & Transformers	LS	1		
	8.03	** Installation of Well Filters & VFDs	EA	2		
	8.04	** Installation of Well 9 Sinewave Filter	EA	1		
	8.05	In-Ground Pull Boxes (Well 9 & 11)	EA	2		
	8.06	Well Power Conduit Extension to Building	LF	150		
	8.07	Well 9 Disconnect & 1850-LF of Conductors	LS	1		
	8.08	Well 10 Disconnect & 45-LF of Conductors	LS	1		
	8.09	Electrical & Controls for HVAC Systems	LS	1		
	8.10	Building Electrical (RCPs) and Lighting	LS	1		
	8.11	Generator Electrical Complete	LS	1		
Add. #2	8.12	Install PLC Process Control Panel, Process Equipment, Conduits & Wiring	LS	1		
Add. #2	8.13	Fire Alarm System Electrical	LS	1		
9	Standby Generator					
	9.01	Diesel Generator	LS	1		
	9.02	Automatic Transfer Switch	LS	1		
	9.03	Air Cooling System	LS	1		
	9.04	Day Tank and Fill Station	LS	1		
	9.05	Muffler	LS	1		
10	Chlorine Disinfection System					
	10.01	System Water Supply Plumbing	LS	1		
	10.02	Well 9 Chemical Booster Pump	LS	1		
	10.03	** Install Solenoid Valves and Injectors	EA	2		
	10.04	System Chemical Discharge Plumbing	LS	1		
11	Orthophosphate System					
	11.01	System Water Supply Plumbing	LS	1		
	11.02	** Install Chemical Metering Pumps	EA	2		
	11.03	Metering Pump Stand	LS	1		
	11.04	Chemical Storage Tank & Feed Plumbing	LS	1		
	11.05	Well 9 Chemical Booster Pump	LS	1		
	11.06	System Chemical Discharge Plumbing	LS	1		
12	Site Improvements					
	12.01	Concrete Aprons	SF	130		
	12.02	Adjust MH Lids & Valve Collars	EA	8		
	12.03	Paved Driveway & Parking	SF	2320		
	12.04	Post, Rail & Wire Fence	LF	250		
	12.05	Access Gate	LS	1		

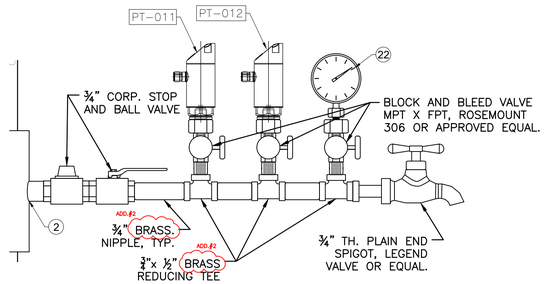
Copyright© 2018 National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers. All rights reserved.





1 / P1.0 **AIR VALVE DETAIL**

Scale: N.T.S.



NOTES:
1. COMPLY WITH PROCESS AND CONTROL NOTES, THIS SHEET.
2. PIPE, PIPE FITTINGS AND VALVES MUST BE DESIGNED TO MEET SERVICE PRESSURES AT EACH LOCATION.
3. INSTALLATION ACCESSORIES (VALVES/SNUBBERS) ARE REQUIRED FOR EACH PRESSURE TRANSDUCER.
4. ALL VALVES, FITTINGS, AND EQUIPMENT SHALL BE BRASS OR STAINLESS STEEL.
5. PROVIDE BUSHINGS WHERE REQUIRED FOR INSTALLATION OF EQUIPMENT
6. COORDINATE INSTALLATION AND CALIBRATION WITH THE CONTROLS CONTRACTOR.

2 / P1.0 **PRESSURE TRANSDUCER DETAIL**

Scale: N.T.S.

GENERAL PROCESS AND CONTROL NOTES:

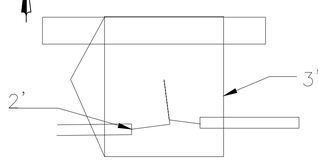
ADD.#1

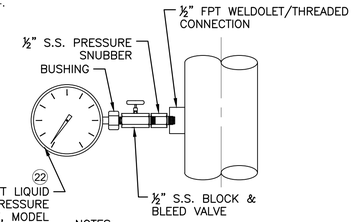
1. EXCEPT AS NOTED OTHERWISE IN THE PROCESS ("P.X") PLANS, CONTRACTOR SHALL INSTALL OWNER FURNISHED PROCESS AND CONTROL EQUIPMENT. IN COORDINATION WITH TOJ'S CONTROLS CONTRACTOR, CONTROL SYSTEMS TECHNOLOGY (CST), INSTALL CST FURNISHED PLC; FURNISH AND INSTALL REQUIRED CONDUITS/RACEWAYS FROM PROCESS EQUIPMENT TO THE PLC; AND FURNISH AND CONNECT ALL CABLING TO PROCESS EQUIPMENT AND PULL ALL CABLING FROM EQUIPMENT TO THE PLC. CONTRACTOR SHALL LABEL ALL WIRES AT THE PLC SO THAT CST CAN EASILY LAND/TERMINATE AT THE PLC FOR INTERFACING WITH PUMP HOUSE SCADA. COMPLY WITH SECTION 25 30 00 AND DIVISION 26 OF THE SPECIFICATIONS, AS WELL AS, NOTES BELOW AND THOSE PROVIDED ON G1.0–G1.5.
2. PROCESS EQUIPMENT CALLED FOR TO BE FURNISHED BY OWNER (*) SHALL BE PROVIDED BY ToJ's CONTROLS CONTRACTOR, CONTROLS SYSTEMS TECHNOLOGY (CST). CONTRACTOR SHALL COMPLY WITH NOTE 1 ABOVE REGARDING INSTALLATION.
3. NOT USED.
4. CONTRACTOR SHALL VERIFY ACTUAL QUANTITY OF FITTINGS BASED ON PLANS AND INSTALLATION CONSTRAINTS. ALL DRAINAGE AND CARRIER CONDUITS SHALL BE INSTALLED WITH "LONG" SWEEP FITTINGS AND BENDS.
5. ALL PIPE HANGERS, SUPPORTS AND ASSOCIATED HARDWARE SHALL BE STAINLESS STEEL. INSTALL ACCORDING TO SPACING REQUIREMENTS IN SPECIFICATION 22 05 29.
6. PROVIDE DIELECTRIC INSULATION BETWEEN COPPER ALLOY AND FERROUS MATERIALS.
7. LABEL PIPING AND EQUIPMENT IN ACCORDANCE WITH SECTION 40 05 53.
8. ALL CHLORINE GAS EQUIPMENT SHALL BE MANUFACTURED BY REGAL.
9. ALL DI PIPING, FITTINGS AND APPURTENANCES SHALL BE SHOP PRIMED AND FIELD COATED WITH 2–COATS OF TENEMEC SERIES N69, 3–5 MILS/ PER COAT, OR APPROVED EQUAL APPLY PER MFG RECOMMENDATIONS.

* PRESSURE TRANSDUCER LOCATED AT WELLS. SEE DETAILS ON SHEET P1.4.

PUMP HOUSE PROCESS PLAN

SCALE: 3/16"=1'-0" (11x17)

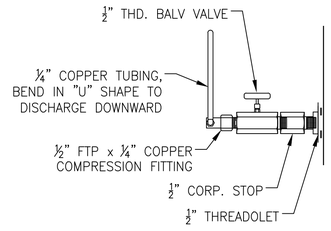




NOTES:
1. INSTALL ALL PRESSURE GAUGES WITH BLOCK AND BLEED VALVE AND PRESSURE SNUBBER.
2. ALL VALVES, FITTINGS, AND EQUIPMENT SHALL BE BRASS OR STAINLESS STEEL.

3 / P1.0 **PRESSURE GAUGE DETAIL**

Scale: N.T.S.



4 / P1.0 **SAMPLING CONNECTION**

Scale: N.T.S.

REV.	DATE	SURVEYED	ENGINEERED	DRAWN	CHECKED	APPROVED
	01/08/2025	n/a	JK	BJG/JK		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE: PUMP HOUSE PROCESS PLAN

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL AND PUMP HOUSE FACILITIES TOWN OF JACKSON, WY

DRAWING NO: P1.0

JOB NO: 23-302-02

S:\Proj\2023\302-02 (toj) High school rd water supply feasibility\4 drawings\Civil\HSR WH\WELL HOUSE PROCESS PLANS.dwg dP10 PUMP HOUSE PROCESS PLAN - Sep 22 2025 09:23:30 am PLOTTED BY bjg DWG FORMAT: 25B

CONTRACTOR REQUIREMENTS

WORK ON EACH WELL WAS COMPLETED IN THREE PHASES. PHASE I AND II WORK HAS ALREADY BEEN, OR WILL BE COMPLETED BY OTHERS. **PHASE III WORK, DESCRIBED BELOW, IS REQUIRED FOR THIS PROJECT.**

PHASE I (BY OTHERS)

DRILL, TEST AND PERMIT WELLS #9 AND #10.

PHASE II (BY OTHERS)

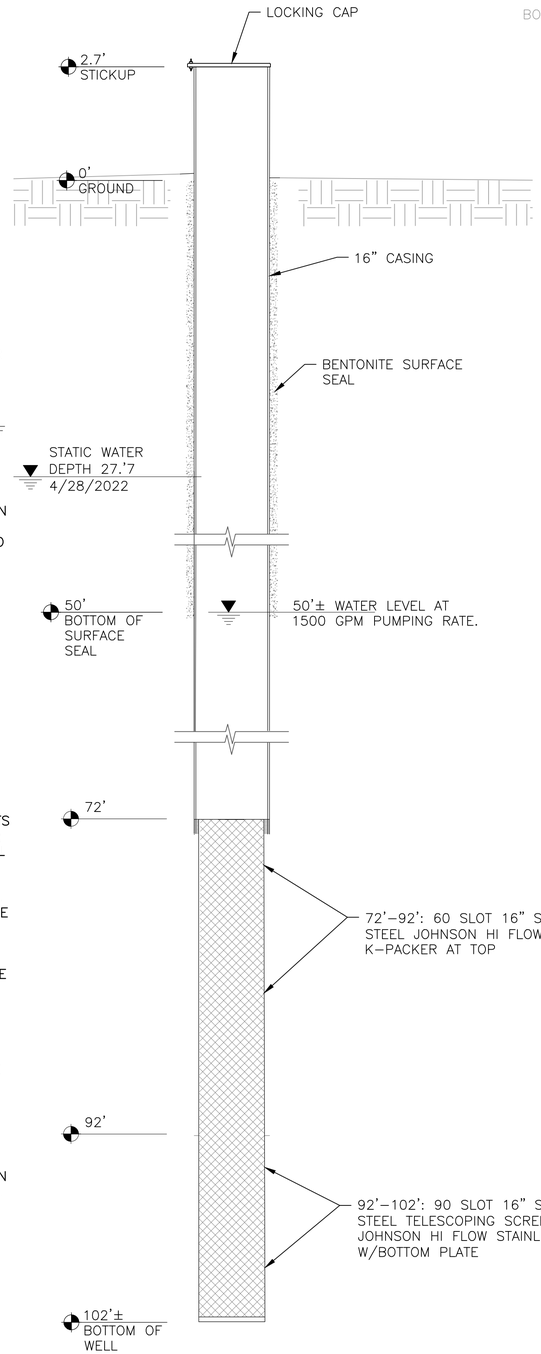
IN ACCORDANCE WITH DETAIL 2/P1.4, WORK AT EACH WELL INCLUDES:

1. CUT WELL CASING AND INSTALL PITLESS ADAPTOR. CONNECT WATER SUPPLY LINE TO PITLESS.
2. FOR WELL #10 ONLY, INSTALL CHEMICAL (CHLORINE AND POLYP) PITLESSES (2 EA.) AND CONNECT TO BURIED CHEMICAL PIPING. TERMINATE CARRIER CONDUIT W/IN 2' OF WELL HEAD AND SEAL ANNULUSES BETWEEN CHEMICAL LINE AND CARRIER PIPE WITH MECHANICAL SEAL, SILICON OR OTHER APPROVED PRODUCT.
3. INSTALL WELL CAP AND ELECTRICAL POWER CONDUIT FROM THE WELL CAP TO FUTURE LOCATION OF THE WELL DISCONNECT; THIS IS THE SAME LOCATION WHERE POWER SUPPLY WILL BE STUBBED UP AND CAPPED ABOVE GRADE PER PLAN. COORDINATE LOCATION OF FUTURE DISCONNECT WITH OWNER/ENGINEER. ELECTRICAL CONDUIT ABOVE GRADE SHALL BE GALVANIZED STL. IN ACCORDANCE WITH NEC.
4. CONNECT 1"ø CONDUIT FOR FUTURE PRESSURE TRANSDUCER CABLE TO WELL CAP.
5. INSTALL CONCRETE WELL PAD AND WELL ENCLOSURE.
6. COMPLETE ALL REQUIRED EXCAVATION AND BACKFILL. THIS INCLUDES PIPE BEDDING AND RE-ESTABLISHMENT OF THE GROUT SEAL AROUND THE WELL HEAD FROM THE BOTTOM OF THE DISCONNECT TO FINISH GRADE.

PHASE III (THIS PROJECT)

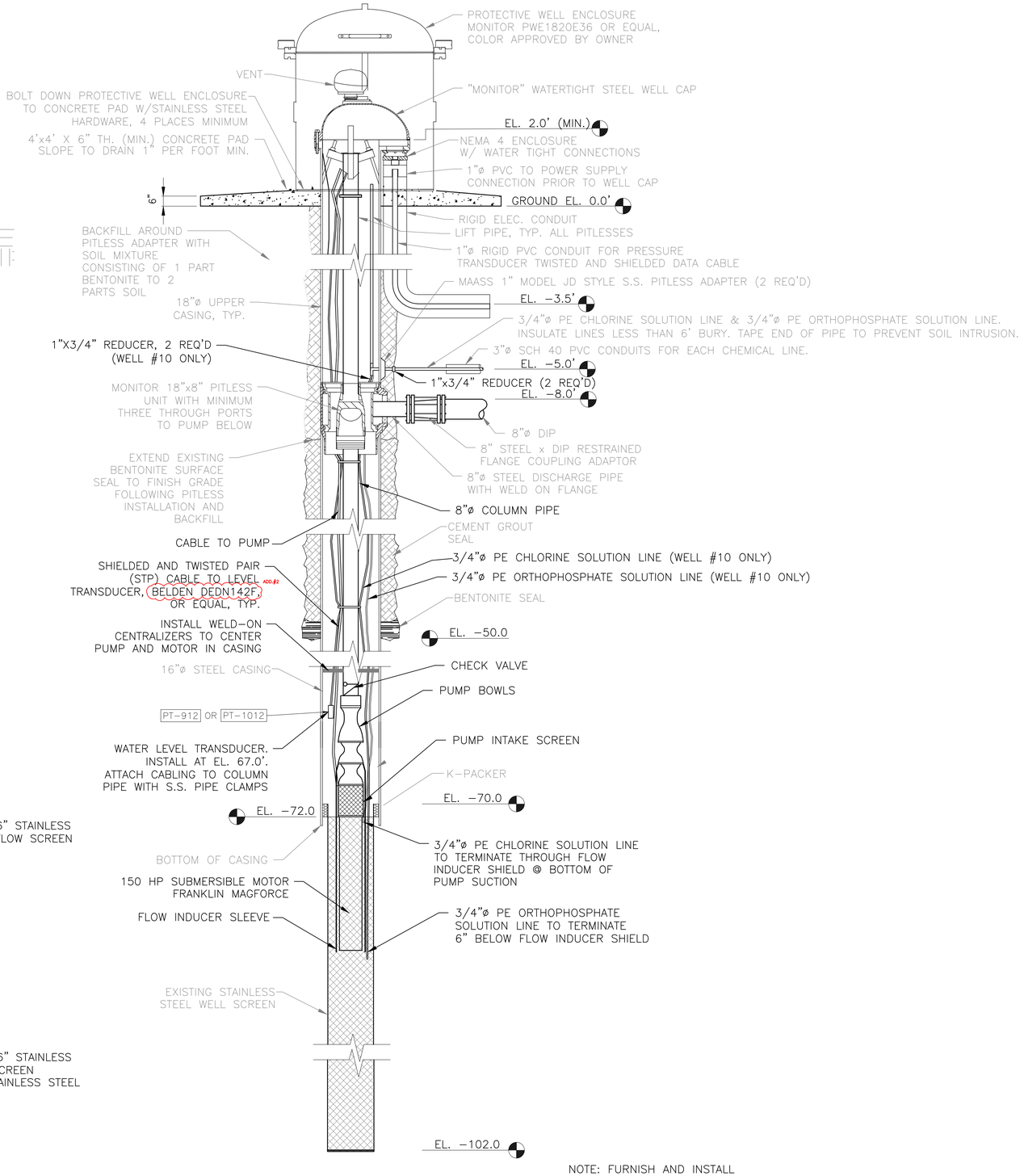
IN GENERAL, WORK INCLUDES INSTALLING ALL EQUIPMENT AND ELECTRICAL FOR FINAL WELL COMPLETION; WORK NOT INCLUDED IN PHASE I OR II WORK. PHASE III WORK INCLUDES COMPLETION OF THE WELL IN ACCORDANCE WITH DETAIL 2/P1.4 AND ITEMS LISTED BELOW.

1. REMOVE WELL PROTECTIVE COVER, CAP AND PITLESS AND FURNISH AND INSTALL PUMP, MOTOR, FLOW INDUCER, PUMP/MOTOR CENTRALIZERS, CHECK VALVE AND COLUMN PIPE. CONTRACTOR SHALL CONFIRM CONNECTIONS TO EXISTING PITLESS ADAPTOR PRIOR TO ORDERING PARTS AND EQUIPMENT.
2. FURNISH AND INSTALL WELL DISCONNECT & PEDESTAL (MYERS, ERICKSON, OR EQUAL) TO WELL MOTOR. NOTE: EXISTING BURIED CONDUITS ARE ALREADY STUB UP AT DISCONNECT LOCATION. ADD.#1
3. FURNISH AND INSTALL (PULL) ALL ELECTRICAL CONDUCTORS FROM THE PUMP HOUSE AND WELL PUMP MOTOR, AND TERMINATE AT THE WELL DISCONNECT. PROVIDE ALL NECESSARY EQUIPMENT AND CONNECTIONS REQUIRED FOR WELL OPERATION. NOTE: THE MAJORITY OF EXISTING CONDUITS AND PULL STRINGS WERE INSTALLED UNDER PHASE II WORK; SEE SHEET C1.1 FOR ADDITIONAL BURIED CONDUIT AND PULL BOX REQUIREMENTS AT THE PUMP HOUSE.
4. FURNISH AND INSTALL PRESSURE TRANSDUCER IN WELLHEAD. FURNISH AND INSTALL (PULL) CABLE FROM THE PUMP HOUSE TO THE WELLHEAD FOR THE PRESSURE TRANSDUCER. PROVIDE ALL NECESSARY EQUIPMENT AND CONNECTIONS REQUIRED FOR INSTRUMENT OPERATION. NOTE: EXISTING CONDUITS AND PULL STRINGS WERE INSTALLED UNDER PHASE II WORK; SEE SHEET C1.1 FOR ADDITIONAL BURIED CONDUIT AND PULL BOX REQUIREMENTS AT THE PUMP HOUSE.
5. FOR WELL #10 ONLY, FURNISH AND INSTALL LIFT AND DROP/COLUMN PIPES FOR CHEMICAL FEED (2 EA.) TO WELL CASING DEPTHS INDICATED IN DETAIL 2/P1.4. CONNECT PIPE TO EXISTING PITLESS ADAPTORS AND ATTACH PE PIPE TO PUMP COLUMN PUMP COLUMN PIPE.
6. SECURE ALL CABLES AND CHEMICAL PIPES TO CENTER COLUMN PIPE WITH S.S. BANDS, OR APPROVED EQUAL. CONTRACTOR SHALL PROVIDED ALL NECESSARY EQUIPMENT AND ATTACHMENTS SO THAT ALL PIPE AND EQUIPMENT WITHIN THE WELL CASING CAN BE READILY PULLED FROM THE WELL FREE OF DAMAGE.
7. COMPLETE WELL STARTUP, COMMISSIONING AND TRAINING. COORDINATE WITH ToJ's CONTROLS CONTRACTOR, CONTROLS SYSTEMS TECHNOLOGY (CST).



1 / P1.4 EXISTING WELL #9 & #10

Scale: N.T.S.



2 / P1.4 WELL #9 & #10 COMPLETION

Scale: N.T.S.

NOTE: FURNISH AND INSTALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH 33 21 13 – PUBLIC WATER SUPPLY WELLS.

DATE	7/24/2024	REV.
SURVEYED	n/a	
ENGINEERED	JK	
DRAWN	BJG/JK	
CHECKED		
APPROVED		

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733–2087

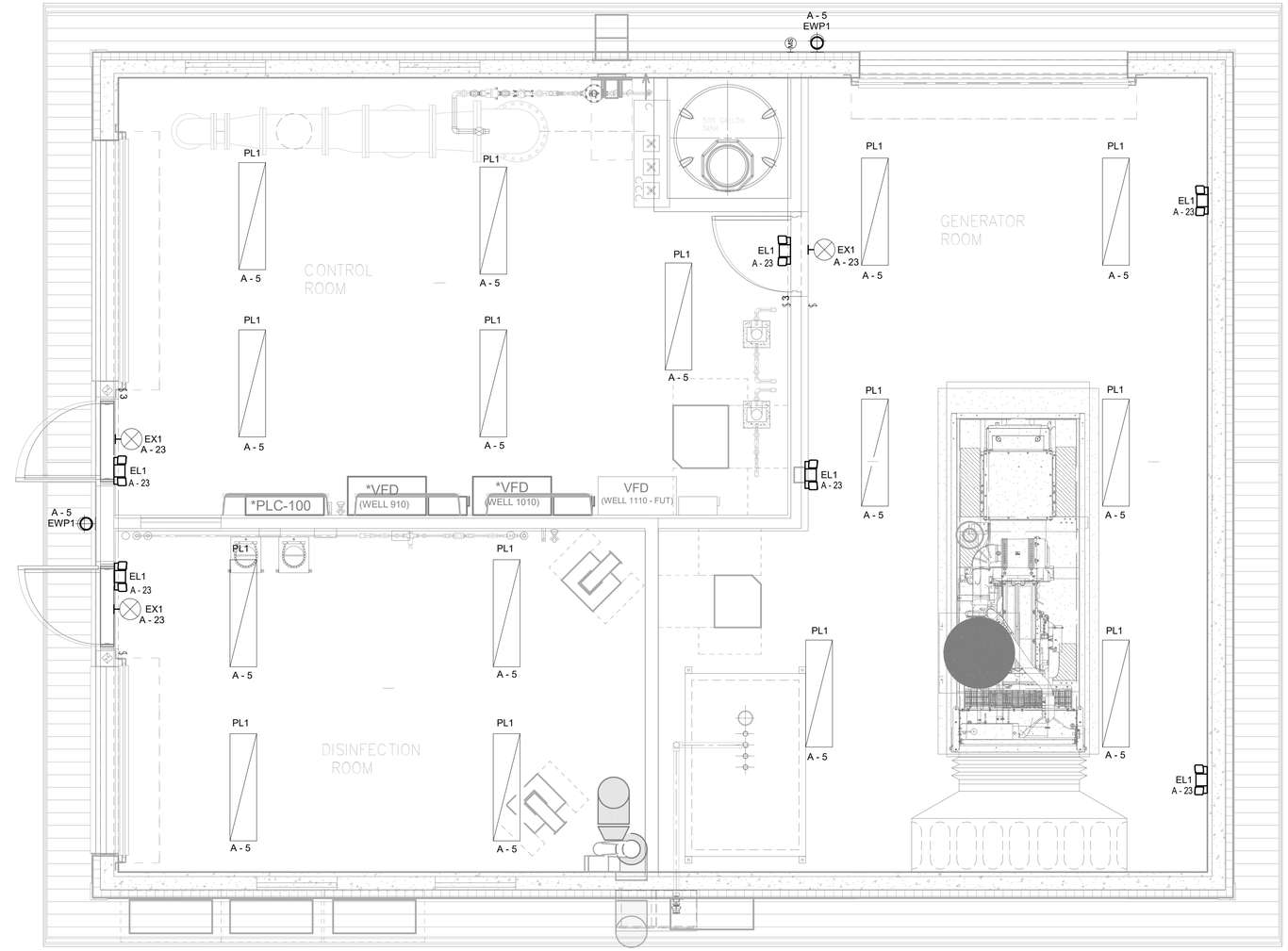
DRAWING TITLE: WELL NO. 9 & 10 DETAILS

JOB TITLE: HIGH SCHOOL ROAD (HSR) WELL HOUSE TOWN OF JACKSON, WY

DRAWING NO: P1.4

JOB NO: 23–302–02

S:\Proj\2023\302-02 (ToJ) High school rd water supply facilities\4 drawings\Civil\HSR WELL 9 & 10 DETAILS.dwg (P1.4 WELL NO. 9 & 10 DETAILS) - Sep 23 2025 08:25:35 am PLOTTED BY: kdpatrick DWG FORMAT: 2D



1 / E2.0 LIGHTING MAIN LEVEL

SCALE: 3/8" = 1'-0"

GENERAL ELECTRICAL NOTES:

A. IT IS ABSOLUTELY NECESSARY FOR ALL TRADES INVOLVED TO COORDINATE WITH EACH OTHER AND VERIFY THAT THERE ARE NO CONFLICTS IN LOCATION OF DUCTS, CONDUITS, DIFFUSERS, BOXES, AND OTHER ITEMS THROUGHOUT THIS PROJECT BEFORE FINAL PLACEMENT OF MATERIALS.

B. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR ALL CUTTING OF FLOORS, WALLS, CEILINGS, AND ROOFS TO PERFORM THE REQUIRED WORK DEPICTED IN THESE DOCUMENTS. THE CONTRACTOR IS RESPONSIBLE FOR ALL PATCHING OF HOLES TO THE SATISFACTION OF THE ARCHITECT/ENGINEER.

C. CONTRACTOR IS FULLY RESPONSIBLE FOR FOLLOWING ALL APPLICABLE CODES AND STANDARDS, AS WELL AS ALL LOCAL ADDENDUM TO THOSE CODES AND STANDARDS, WHETHER SPECIFICALLY SHOWN ON THESE DRAWINGS OR NOT.

KEYED NOTES (#)

LUMINAIRE SCHEDULE

MARK	Manufacturer	Model	Description	LOAD	Initial Color Temperature
EL1	COOPERS LIGHTING	SURE-LITES AP2SQLED30	PROVIDES EMERGENCY LIGHTING FOR A MINIMUM OF 90 MINUTES, ADJUSTABLE HEAD	0 VA	4000 K
EWP1	ACUITY BRANDS LIGHTING	WDGE2 LED-P0-40K-80CRI-T1S-M VOLT-SRM-E20WC-PE	ARCHITECTUAL WALL SCONCE PRECISION REFRACTIVE OPTIC, PROVIDE WITH INTEGRAL PHOTO-CELL	7 VA	4000 K
EX1	COOPERS LIGHTING	SURE-LITES APXRG	LONG LIFE LED LAMPS	2 VA	4000 K
PL1	LSI INDUSTRIES	SDL4-50L-FL-UNV-40-80C RI-EM10	RECESSED DIFFUSED LENS STRIP - INDOOR INDUSTRIAL LED STRIP LIGHT,4' LENGTH, FROSTED LENS, BATTERY PACK NOT REQUIRED.	38 VA	4000 K

Add. #2

Professional Engineer
DAVID MAGID
18997
WYOMING
Date 04/16/2026

Revisions

#	Description	Date

Drawing Title
LIGHTING MAIN LEVEL

Date
2026.04.16

Mechanical:
Engineering
David Magid
3520 South Park Drive
Jackson, WY 83001
307.200.2210

Civil:
Nelson Engineering
Josh Kilpatrick
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Structural:
Nelson Engineering
Caleb Hansen
430 S. Cache St.
Jackson, WY 83001
307.733.2087

Client:
TOWN OF JACKSON

Project:
TOWN HIGH SCHOOL ROAD
PUMP HOUSE

Architect:
Alder 45, LLC
mail PO Box 4055
Jackson, WY 83001
office 610 W Broadway Ave #103
Jackson, WY 83001
phone 307.249.8650

E2.0

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Town Council Regular Mtg
Submitting Department:	Internal Services	**Presenter:**	Roxanne Robinson
Agenda Item:	Ordinance A, An Ordinance Addressing Conflicts of Interest for Town Employees	**Public Comment:**	Yes

Purpose & Policy Considerations.
The Town Council approves all ordinances. Wyoming Statute 15-1-127(c) mandates that the Town have an ordinance prescribing requirements governing conflicts of interest by any employee and any member of their immediate family and procedures by which any employee and any member of their immediate family may be exempt from those requirements. This ordinance establishes these requirements.

Requested Action.
Staff requests Council approve Ordinance A, An Ordinance Addressing Conflicts of Interest for Town Employees on second reading as presented.

Recommendations.
Staff recommends Council approve Ordinance A, An Ordinance Addressing Conflicts of Interest for Town Employees on second reading as presented.

Background.
The Town Council approved Policy Manuals for Town employees at the March 17, 2025 regular meeting. The previous Policy Manual contained information in multiple areas relating to use of Town property, political activity, endorsement of products, gifts and favors, but did not contain a specific section regarding conflicts of interest.

During the update process, staff learned that Wyoming Statute 15-1-127(c) mandates that the Town have an ordinance prescribing requirements governing conflicts of interest by any employee and any member of their immediate family and procedures by which any employee and any member of their immediate family may be exempt from those requirements. Staff realized that we did not have such an ordinance in our municipal code. Staff also wanted to address service on appointed Town or Town/County boards, service on boards of organizations receiving funding from the Town, and outside employment.

Council adopted this ordinance on first reading at the October 6, 2025 Town Council meeting.

Analysis.
Next Steps:

- This ordinance will be presented for 1 additional readings and upon final adoption, advertised in the paper and become effective. The ordinance changes will be codified with the next update to the Municipal Code.
- Once effective, Internal Services will conduct education and training sessions for employees and provide information online for employees.
- Internal Services will provide notification to employees on how to disclose outside employment and/or ask for an exemption for documentation, for management to ensure that the outside employment is in compliance with the ordinance as it relates to adverse impacts, and to determine if any exemption is warranted.
- Once effective, Internal Services will provide a deadline for staff to submit any disclosures or requests for exemptions to bring all staff into compliance.

Key Question #1. Does the Town Council support the Conflicts of Interest Ordinance as presented on second reading?

Staff welcomes Council questions and input into this ordinance.

Possible Alternatives.
Council could delay second reading until a future date and/or ask for further information on specific areas or requirements. Should substantive changes be made, the ordinance would go back to first reading.

Comprehensive Plan & Priority Alignment.
The ability of the Town of Jackson to implement and take actions aligned with the Comprehensive Plan depends on the ability to recruit and retain an effective and trusted workforce, and one that the community can rely on to act ethically. Establishing policies for employees that address trust and ethics in our day-to-day work leads to a positive working environment and the provision of quality services and is aligned with Common Value #3, Quality of Life, and directly relates to Section 8, Quality Community Service Provision.

Fiscal Impact.
There is no fiscal impact as a result of establishing policies related to conflicts of interest. There is a fiscal impact for adoption of ordinances, as they must be advertised. The cost to advertise an ordinance is dependent upon the length and runs between $300 - $800 for shorter ordinances.

Staff Impact.
The staff impact of this ordinance, separate from the Policy Manual update project, is approximately 42 hours and includes time spent by the Director of Internal Services with additional time spent by the Town Manager, Department Directors, the Town Attorney, and employees. Staff impact after adoption is estimated at an additional 20 hours including conducting training with employees, completion of forms for outside employment by staff, and completion of finalization and the codification process.

Attachments or Links.
Ordinance A, An Ordinance Addressing Conflicts of Interest for Town Employees.

Suggested Motion.
I move to adopt Ordinance A, An Ordinance Addressing Conflicts of Interest for Town Employees on second reading as presented.

ORDINANCE A

AN ORDINANCE ADDING SECTION 2.50, CONFLICTS OF INTEREST, TO TITLE 2, ADMINISTRATION AND PERSONNEL, OF THE MUNICIPAL CODE OF THE TOWN OF JACKSON, WYOMING.

BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF JACKSON, WYOMING:

SECTION I.

Sections 2.50, Conflicts of Interest of Title 2, Administration and Personnel, of the Municipal Code of the Town of Jackson, Wyoming, is hereby added to read as follows:

2.50 CONFLICTS OF INTEREST

2.50.010 – Purpose.

The purpose of this section is to prescribe requirements governing conflicts of interest for Town Employees and their immediate family and procedures by which an Employee or their immediate family may be exempt from those requirements.

(Ord. ____ § 1, 2025)

2.50.020 – Definitions.

A. *Anything of value* means:

1. A pecuniary item, including money or a bank bill or note;
2. A promissory note, bill of exchange, order, draft, warrant, check, or bond given for the payment of money;
3. A contract, agreement, promise, or other obligation for an advance, conveyance, forgiveness of indebtedness, deposit, distribution, loan, payment, gift, pledge or transfer of money;
4. A stock, bond, note, or other investment interest in an entity;
5. A right in action;
6. A gift, tangible good, or chattel or an interest in a gift, tangible good, or chattel;
7. A work of art, antique, or collectible;
8. An automobile, bicycle, electric bicycle, or other means of personal transportation;
9. Real property or an interest in real property, including title to realty, a fee simple or partial interest, present or future, contingent or vested within realty, a leasehold interest or other beneficial interest in realty;
10. An honorarium or compensation for services arising out of the person's service as a Town Employee;
11. The sale or trade of anything of value:
    i. For reasonable consideration that would ordinarily not be available to a member of the public; or

ii. With a rebate or at a discount in its price, unless the rebate or discount is made in the ordinary course of business to a member of the public, or any group or category thereof, but without regard to that person's status as a Town Employee.

12. A promise or offer of employment;
13. Any other thing of value that is pecuniary or compensatory in value to a person.

B. *Compensation* includes:
   1. An advance, conveyance, forgiveness of indebtedness, deposit, distribution, loan, payment, gift, pledge, or transfer of money or anything of value; or
   2. A contract, agreement, promise or other obligation for an advance, conveyance, forgiveness of indebtedness, deposit, distribution, loan, payment, gift, pledge or transfer of money or anything of value, for services rendered or to be rendered.

C. *Compensation* does not include:
   1. Reimbursement of expenses if the reimbursement does not exceed the amount actually expended for the expenses, and if the reimbursement is substantiated by an itemization of expenses; or
   2. Per-diem payments or mileage allowances paid by the Town in accordance with applicable law.

D. *Employee* is defined as any person employed by the Town of Jackson in a full-time, part-time, or variable hour capacity.

E. *Gift* means anything of value to the extent that consideration of equal or greater value is not received, but excludes the following:
   1. A gift that:
      i. Is not used; and
      ii. No later than thirty (30) days after receipt is returned to the donor or delivered to a charitable organization and is not claimed as a charitable contribution for federal income tax purposes.
   2. A certificate, commemorative token or item, or plaque with a value that does not exceed two hundred fifty dollars ($250.00);
   3. Food and beverage;
   4. Compensation, per-diem or other payments or benefits which the Employee receives in the performance of services for the Town;
   5. Any loan, gift, gratuity, special discount, or hospitality with a value of two hundred fifty dollars ($250.00) or less; or
   6. Travel, registration, and lodging for any conference or meeting while attending in their official capacity as a Town Employee.

F. *Immediate family* is defined as an Employee's spouse, children, parent, sibling, grandparent, or grandchild; or is a member of the individual's household.

2.50.030 – Use of Title and Prestige of Public Office.

No Employee shall use their office or position for their private benefit. As used in this section, "private benefit" means the receipt by the Employee of a gift which resulted from their holding their position with the Town.

(Ord. ____ § 1, 2025)

2.50.040 – Misuse of Office.

A. No Employee shall use Town funds, time, personnel, facilities, or equipment for their private benefit or that of another unless the use is authorized by law.
B. No Employee shall use public funds, time, personnel, facilities, or equipment for political or campaign activity.
C. No Employee shall use their official authority or influence to interfere with or affect the result of an election including using their official title/position while engaged in political activity or inviting subordinate Employees to political events or otherwise suggest to subordinates that they attend political events or undertake any partisan political activity.
D. No Employee shall knowingly solicit or discourage the participation in any political activity of anyone who has business pending before the Town.
E. No Employee shall engage in political activity while on duty. This prohibition includes:
    a. Wearing political buttons, clothing, hats, or attire of any kind.
    b. Displaying or distributing campaign materials.
    c. Performing campaign-related tasks or work.
    d. Making political contributions.
    e. Attending any political event in a Town vehicle or bike.
    f. Posting comments to a public or social media site advocating for or against a partisan political party, candidate for partisan office, or partisan political group.
    g. Utilizing a Town email account or Town social media site to distribute, send, or forward content that advocates for or against a partisan political party, candidate for partisan political office, or partisan political group.
    h. Engaging in any activity that violates the Town Employee Policy Manual.
F. No Town Employee shall disseminate to another person official information which the Employee obtains through or in connection with their employment, unless the information is available to the general public or unless the dissemination is authorized by law.

(Ord. ____ § 1, 2025)

2.50.050 – Outside Employment; Disclosure of Outside Employment.

A. For purposes of this section, outside employment means any form of employment, business relationship or activity, involving the provision of personal services whether or not for compensation, other than in the discharge of official duties.
B. No Town Employee shall engage in outside employment that:
    1. Adversely impacts the Employee's job performance or attendance with the Town.
    2. Adversely impacts the reputation of the Town or any department of the Town.
    3. Adversely impacts the Employee's physical or mental capacity to perform their job duties.
    4. Adversely impacts the proper functioning of Town offices and departments or inhibits the effective delivery of public services.
    5. Is conducted at the same time as work being performed for the Town.

C. All Employees shall disclose prospective outside employment to their department director prior to commencement of any such employment, and the Town Manager, or their designee, may review the prospective outside work for compliance with this ordinance and any other Town policies.

(Ord. ____ § 1, 2025)

2.50.060 – Participation or Membership in Organizations that Advocate, Incite, or Support Criminal Acts or Subversion of Government.

No Employee shall participate or hold membership in any organization that advocates, incites, or supports criminal acts or subversion of government.

(Ord. ____ § 1, 2025)

2.50.070 – Financial Relationships and Undue Favor.

A. No Employee shall recommend the Town enter into a financial relationship or be a party to a financial relationship or approve any financial relationship with any member of their immediate family that could provide their immediate family a financial benefit that is only available due to the Employee's employment.
B. No Employee shall make decisions or influence decisions that could unduly favor relatives, friends, or associates in employment or contractual opportunities with the Town.

(Ord. ____ § 1, 2025)

2.50.080 – Service on Boards.

A. No Employee shall serve on:

1. A Town of Jackson or joint Town of Jackson and Teton County appointed board, committee, or task force; or
2. The board of an organization approved for funding in the current fiscal year or upcoming fiscal year budget unrelated to their employment with the Town.

(Ord. ____ § 1, 2025)

2.50.090 – Coordination with Policy Manual

All Employees shall comply with the Town Employee Policy Manual as it relates to conflicts of interest which includes, but is not limited to, subjects such as social media and external communications, appearance and attire, political participation, confidential information and records, and email.

2.50.100 – Violations.

Any violations of conflicts of interest, as determined by the Town Manager or their designee, shall be addressed in accordance with the Town Employee Policy Manual.

(Ord. ____ § 1, 2025)

2.50.110 – Exemptions and Exemption Procedure.

A. A Police Department Employee is exempt from the prohibition against attending any political event in a Town vehicle or bike while on duty if their attendance is required as part of their official duties.

B. An Employee is exempt from the prohibition for outside employment conducted at the same time as work being performed by the Town if the outside employment in no way impacts their performance of their duties except for de minimis activities such as very infrequent and brief texts, phone calls, or emails.

C. A Police Department Employee is exempt from the prohibition against participation or membership in any organization that advocates, incites, or supports criminal acts or subversion of government if such participation or membership is part of a criminal investigation.

D. An Employee or their immediate family is exempt from the prohibition against a financial relationship if the financial relationship was decided by the Town Council.

E. Requests for exemption shall be submitted in writing by the Employee's department director to the Town Manager for consideration in a timely manner and the Town Manager will either approve or deny the request in writing within five (5) business days of receipt of the request.

(Ord. ____ § 1, 2025)

SECTION II.

All ordinances and parts of ordinances in conflict with the provisions of this ordinance are hereby repealed.

SECTION III.

If any section, subsection, sentence, clause, phrase, or portion of this ordinance is for any reason held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision and such holding shall not affect the validity of the remaining portions of the ordinance.

SECTION IV.

This Ordinance shall become effective after its passage, approval, and publication.

PASSED 1ST READING THE 6TH DAY OF OCTOBER, 2025.

PASSED 2ND READING THE _____DAY OF _____ , 2025.
PASSED AND APPROVED THE _____DAY OF _____, 2025.

TOWN OF JACKSON

BY: _____

Arne Jorgenson, Mayor

ATTEST:

BY: _____

Riley Hovorka, Town Clerk

ATTESTATION OF TOWN CLERK

STATE OF WYOMING)

) ss.

COUNTY OF TETON)

I hereby certify that the foregoing Ordinance No. was duly published in the Jackson Hole News and Guide, a newspaper of general circulation published in the Town of Jackson, Wyoming, on the _____day of _____, 2025.

I further certify that the foregoing Ordinance was duly recorded on page _____ of Book _____ of Ordinances of the Town of Jackson, Wyoming.

_____

Riley Hovorka, Town Clerk

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Town Council Regular Meeting
Submitting Department:	Legal	**Presenter:**	Lea Colasuonno
Agenda Item:	Jackson Municipal Code Maintenance: Title 15, Buildings and Construction	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is for the Council to review a few technical updates and one Council-directed policy update to Title 15, Buildings and Construction, of the Jackson Municipal Code Council.

Requested Action.
Staff request the Council review the updates to Title 15 detailed in the redline draft.

Recommendations.
Staff recommends approving the ordinances at third reading.

Background.
The Town periodically updates the Municipal Code to ensure its applicability and content match the community's and municipality's needs and are relevant to current times and Title 15 was updated in 2024. Recently, Planning & Building and Legal Department staff noticed a few technical items that were left out of the 2024 update. Second, in August Council considered a policy change with respect to providing a licensing exemption for youth working in the trades and directed staff to provide a redline of such an update for consideration.

The attached ordinances accomplish the staff requested updates and provide a draft for the Council to consider for the exemption for youth for Certificates of Qualification.

Analysis & Key Policy Questions.
Key policy questions and issues were reviewed and addressed at the September 15, 2025 Council Meeting and can be found in that staff report.

Possible Alternatives
The Council could elect not to approve these ordinances at third reading.

Comprehensive Plan & Priority Alignment.
Section 8.1 and 8.2: Timely, efficiently, and safely deliver quality services and facilities in a fiscally responsible and coordinated manner.

Fiscal Impact.
Revenue: There are no revenue impacts resulting from this update of Title 15.

Expense: The expense of this item is solely associated with the cost of the ordinance itself.

- The Town of Jackson contracts with the company MuniCode to host the Jackson Municipal Code and process changes enacted by the Council. The supplement service to codify new ordinances costs $3,000 annually and does not fluctuate with the number of ordinances enacted by the Council, thus the fiscal impact of this ordinance (and all) codification is minimal.

- The Town is, pursuant to statute, required to publish ordinances in a newspaper of general circulation in the community (which is the News & Guide weekly). The cost of publication varies, depending on ordinance length, and is a minimum of $200 for short ordinances.

Staff Impact.
The staff impact of this update of the Municipal Code was moderate.
The Legal Department has spent, approximately, 10 hours working on this update and coordinated with the Building and Planning Departments as well, requiring approximately 8 hours of their time.

Attachments or Links.
Ordinance B
Ordinance C

Suggested Motion.
I move to approve Ordinances B and C at third reading and designate them Ordinance _____ and ____..

ORDINANCE B

AN ORDINANCE AMENDING TITLE 15, CHAPTER 15.17, INTERNATIONAL RESIDENTIAL CODE, OF TITLE 15, BUILDINGS AND CONSTRUCTION, OF THE CODE OF THE TOWN OF JACKSON, WYOMING.

BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF JACKSON, WYOMING:

SECTION I.

Section 15.17.010, International Residential Code—Adoption by reference, of Chapter 15.17, International Residential Code, of Title 15, Building and Construction, of the Code of the Town of Jackson, Wyoming, is hereby amended as follows:

15.17.010- International Residential Code—Adoption by reference.

A. . . . , specifically including Appendix ~~AF~~BE.

B. . . .

7. *Table R301.2(1)* shall read as follows:

Ground snow load	~~93 psf~~ Varies, please reference 2024 IRC R301.2.3 and 2024 IBC Section 1608
. . .	. . .
. . .	. . .
. . .	. . .
. . .	. . .
. . .	. . .
. . .	. . .
. . .	. . .
. . .	. . .
. . .	. . .
. . .	. . .

SECTION II.

All ordinances and parts of ordinances in conflict with the provisions of this ordinance are hereby repealed.

SECTION III.

If any section, subsection, sentence, clause, phrase, or portion of this ordinance is for any reason held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision and such holding shall not affect the validity of the remaining portions of the ordinance.

SECTION IV

The penalty for violating any provision of this Ordinance is up to a maximum of $750.00 per day, per violation.

SECTION V.

This Ordinance shall become effective after its passage, approval, and publication.

PASSED 1ST READING THE _____DAY OF _____ , 2025.

PASSED 2ND READING THE _____DAY OF _____ , 2025.

PASSED AND APPROVED THE _____DAY OF _____, 2025.

TOWN OF JACKSON

BY: _____

Arne O. Jorgensen, Mayor

ATTEST:

BY: _____

Riley Hovorka, Town Clerk

ATTESTATION OF TOWN CLERK

STATE OF WYOMING)

) ss.

COUNTY OF TETON)

I hereby certify that the foregoing Ordinance No. ____was duly published in the Jackson Hole News and Guide, a newspaper of general circulation published in the Town of Jackson, Wyoming, on the _____day of

_____, 2025.

ORDINANCE C

AN ORDINANCE AMENDING TITLE 15, CHAPTER 15.36, CONTRACTOR LICENSING AND CERTIFICATION, OF TITLE 15, BUILDINGS AND CONSTRUCTION, OF THE CODE OF THE TOWN OF JACKSON, WYOMING.

BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF JACKSON, WYOMING:

SECTION I.

Section 15.36.035, Applications—Initial and renewal, of Chapter 15.36, Contractor Licensing and Certification, of Title 15, Building and Construction, of the Code of the Town of Jackson, Wyoming, is hereby amended as follows:

. . .

License	Bond amount
General Contractor (Class A)	$250,000.00
Building Contractor (Class B)	$250,000.00
Building Contractor—Restricted (Class Br)	$100,000.00
Residential Contractor (Class C)	$100,000.00
All Other Contractors	$20,000.00

. . .

License	Limit Per Occurrence	Total Aggregate
General Contractor (Class A)	$1,000,000.00	$2,000,000.00
Building Contractor (Class B)	$1,000,000.00	$2,000,000.00
Building Contractor—Restricted (Class Br)	$500,000.00	$1,000,000.00
Residential Contractor (Class C)	$500,000.00	$1,000,000.00
All Other Contractors	$500,000.00	$1,000,000.00

. . .

(Ord. _____ § ___, 2025; Ord. 1380 § I, 2024).

SECTION II.

Section 15.36.039, Denial, revocation, and suspension, of Chapter 15.36, Contractor Licensing and Certification, of Title 15, Building and Construction, of the Code of the Town of Jackson, Wyoming, is hereby amended as follows:

15.36.039 – Denial, revocation, and suspension.

A. The Town Manager, or their designee, may deny an application except for an application for reciprocity pursuant to Wyo. Stat. Ann. § 16-6-1101, as amended, and may suspend or revoke an issued License or Certificate of

Qualification, whether initially issued via reciprocity or otherwise, when the applicant/holder commits any one or more of the following acts or omissions:

. . .

12. The License or Certificate of Qualification application does not satisfy the minimum requirements for the License or Certificate sought.

. . .

C. When the Town Manager, or their designee, deems that a License or Certificate of Qualification issued hereunder shall be denied, suspended, or revoked, the procedure shall be as follows:

1. ~~The applicant or Licensee or Certificate of Qualification holder shall be notified by the Town Manager, or their designee, in writing, sent via certified mail; such notice shall be sent at least 15 days prior to the action contemplated, setting forth the reasons therefor.~~ The applicant, Licensee, or Certificate of Qualification holder shall be notified by the Town Manager, or their designee, in writing, via certified mail; for a denial, such notice shall be sent contemporaneously with the denial, and for a suspension or revocation, such notice shall be sent at minimum 21 days prior to the effective date of the suspension or revocation and shall state the effective date of the suspension or revocation; and such notices shall include the reasons for the denial, suspension or revocation.

2. ~~Upon receipt of the notice, the applicant or Licensee or Certificate of Qualification holder may request a hearing before the Town Council. Such request shall be in writing and shall be received by the Town Manager, or their designee, within 15 days of the postal date of the suspension or revocation notice; failure on the part of the applicant or License or Certificate of Qualification holder to request a hearing in writing and within the specified time period shall be deemed a waiver of their right to a hearing.~~ Upon receipt of the notice, the applicant, Licensee, or Certificate of Qualification holder may request a hearing before the Town Council. Such request shall be in writing and must be received by the Town Manager, or their designee, within 21 days of the postal date of the denial, suspension, or revocation notice; failure on the part of the applicant, License, or Certificate of Qualification holder to request a hearing in writing and within the specified time period shall be deemed a waiver of their right to a hearing.

3. ~~If a hearing is requested by the applicant or Licensee or Certificate of Qualification holder, the Town Manager, or their designee, shall set the time, date, and location, which shall be not less than 15 days and not more than 45 days of receipt of the notice requesting such. The Town Manager, or their designee, shall notify the applicant or License or Certificate of Qualification holder in writing, sent by certified mail, of the hearing.~~ If a hearing is requested by the applicant, License, or Certificate of Qualification holder, the Town Manager, or their designee, shall set the time, date, and location of the hearing within 45 days of receipt of the notice requesting such. The Town Manager, or their designee, shall notify the applicant, License, or Certificate of Qualification holder in writing, via certified mail, of the hearing, which notice shall also provide that any suspension or revocation of a License or Certificate of Qualification shall be stayed until after the hearing.

4. . . .

5. . . .

D. . . .

(Ord. _____ § ___, 2025; Ord. 1380 § I, 2024).

SECTION III.

15.36.040- Contractor License Section, of Chapter 15.36, Contractor Licensing and Certification, of Title 15, Building and Construction, of the Code of the Town of Jackson, Wyoming, is hereby amended as follows:

15.36.040- Contractor Licenses

A. . . .

B. . . .

C. . . .

~~D. *Exemptions*. A firm, corporation, or other corporate organization may undertake the types of work regulated by this Chapter within the Town without first obtaining a License only under the following exemptions:~~

~~1. Permits-Exempt Building Code Provisions. The owner or tenant of a commercial structure or tenant space may perform their own repairs or maintenance as permitted in the permits-exempt work provisions of each applicable code adopted by the Town.~~

~~2. Proprietary Certificate of Qualification. An individual employed by a Person may perform work requiring a permit without a Contractor's License, provided they have been granted a Proprietary Certificate of Qualification specific to one business and specific to the trade(s) applicable to the work being performed.~~

~~3. Sewer and Water Service Lines. Sewer and water service line installation and repair work from a structure to the public sewer or public watermain shall be exempt from the requirements of this Chapter. However, this shall not exempt the work being performed from the requirements of a permit pursuant to the current edition of the adopted code.~~

SECTION IV.

15.36.060 - Exemptions, of Chapter 15.36, Contractor Licensing and Certification, of Title 15, Building and Construction, of the Code of the Town of Jackson, Wyoming, is hereby added as follows:

15.36.060 - Exemptions

A. *Exemptions.* A person, firm, corporation, or other corporate organization may undertake the types of work regulated by this Chapter within the Town without first obtaining either a License or Certificate of Qualification, or both, as the case may be, only under the following circumstances:

1. *Permits-Exempt Building Code Provisions.* The owner or tenant of a commercial structure or tenant space may perform their own repairs or maintenance as permitted in the permits-exempt work provisions of each applicable code adopted by the Town.

2. *Proprietary Certificate of Qualification.* An individual employed by a Person may perform work requiring a permit without a Contractor's License, provided they have been granted a Proprietary Certificate of Qualification specific to one business and specific to the trade(s) applicable to the work being performed.

3. *Sewer and Water Service Lines.* Sewer and water service line installation and repair work from a structure to the public sewer or public watermain shall be exempt from the requirements of this Chapter. However, this shall not exempt the work being performed from the requirements of a permit pursuant to the current edition of the adopted codes.

4. *State of Wyoming.* An individual employed exclusively by the State of Wyoming may perform work on properties owned by the State of Wyoming without a Contractor's License, a Certificate of Qualification, or bonding.

5. *Individuals Under the Age of 18 Years Old*. Beginning on January 1, 2026, individuals under the age of 18 years old may work in the trades regulated by this Chapter without a Certificate of Qualification. Individuals must apply for and obtain the appropriate Certificate of Qualification card upon turning 18 years old and, after verification of work history, may be given up to 100% credit for the hours worked after January 1, 2026 while under the age of 18 years old.

SECTION V

The penalty for violating any provision of this Ordinance is up to a maximum of $750.00 per day, per violation.

SECTION VI.

All ordinances and parts of ordinances in conflict with the provisions of this ordinance are hereby repealed.

SECTION VII.

If any section, subsection, sentence, clause, phrase, or portion of this ordinance is for any reason held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision and such holding shall not affect the validity of the remaining portions of the ordinance.

SECTION VIII.

This Ordinance shall become effective after its passage, approval, and publication.

PASSED 1ST READING THE _____DAY OF _____ , 2025.

PASSED 2ND READING THE _____DAY OF _____ , 2025.

PASSED AND APPROVED THE _____DAY OF _____, 2025.

TOWN OF JACKSON

BY: _____

Arne O. Jorgensen, Mayor

ATTEST:

BY: _____

Riley Hovorka, Town Clerk

ATTESTATION OF TOWN CLERK

STATE OF WYOMING)

) ss.

COUNTY OF TETON)

I hereby certify that the foregoing Ordinance No. ____was duly published in the Jackson Hole News and Guide, a newspaper of general circulation published in the Town of Jackson, Wyoming, on the _____day of _____, 2025.

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Town Council Meeting Regular
Submitting Department:	Legal	**Presenter:**	Lea Colasuonno
Agenda Item:	Jackson Municipal Code Maintenance: Title 15, Buildings and Construction	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is for the Council to review a few technical updates and one Council-directed policy update to Title 15, Buildings and Construction, of the Jackson Municipal Code Council.

The comprehensive information and analysis for this Item – Ordinance C – was included in the September 15, 2025 staff report for Ordinance B.

Requested Action.
See September 15, 2025 staff report for Ordinance B.

Recommendations.
See September 15, 2025 staff report for Ordinance B.

Background.
See September 15, 2025 staff report for Ordinance B.

Analysis & Key Policy Questions.
See September 15, 2025 staff report for Ordinance B.

Possible Alternatives.
See September 15, 2025 staff report for Ordinance B.

Comprehensive Plan & Priority Alignment.
See September 15, 2025 staff report for Ordinance B.

Fiscal Impact.
See September 15, 2025 staff report for Ordinance B.

Staff Impact.
See September 15, 2025 staff report for Ordinance B.

Attachments or Links.
See September 15, 2025 staff report for Ordinance B.

Suggested Motion.
I move to approve Ordinances B and C at third reading and designate them Ordinance _____ and ____.

STAFF REPORT

Meeting Date:	October 20, 2025	**Meeting Title:**	Regular
Submitting Department:	Legal	**Presenter:**	Lea Colasuonno
Agenda Item:	Ordinance: Banning Human Burial Outside of Aspen Hill Cemetery	**Public Comment:**	Yes

Purpose & Policy Considerations.
The purpose of this item is for the Town Council to consider adding an ordinance to the Jackson Municipal Code prohibiting the burial of human remains outside the Aspen Hill Cemetery.

Requested Action.
Staff requests the Town Council consider the ordinance attached to the staff report.

Recommendations.
Staff recommend the Town Council approve the ordinance attached to the staff report.

Background.
On March 17, 2025, the Town Council reviewed various policies and practices of the Aspen Hill Cemetery. Items discussed during the March 17 Meeting included interment capacity at the Cemetery, plot purchase regulations, current policies in the resolution regulating the Cemetery, and, lastly, adding an ordinance banning human burials outside of the Aspen Hill Cemetery. Currently there's no such prohibition in the Town of Jackson.

While the first three items listed above will take more time for staff to present to the Council, the ordinance banning human burials within the Town, but outside of the Aspen Hill Cemetery, is being presented in this staff report because of the minimal work required to follow up on the Council directive.

Analysis & Key Policy Questions.
The key policy questions and analysis regarding the issue of prohibiting human burials outside of the Aspen Hill Cemetery were discussed, and resolved, by Council on March 17.

Possible Alternatives.
The Council has the option to:
1) Modify the ordinance attached to this staff report; or
2) Not approve the ordinance attached to this staff report

Comprehensive Plan & Priority Alignment.
This item aligns, generally, with the Comprehensive Plan by ensuring the general welfare, health, and safety of the community and its environment.

Fiscal Impact.
Revenue: There are no revenue impacts resulting from this update of Title 12.
Expense: There are no direct expenses for this item.

Staff Impact.
The staff impact of this update of the Municipal Code was minimal.

The Legal Department spent approximately 1 hour drafting the Ordinance and this staff report.

Attachments or Links.
Ordinance D

Suggested Motion.
I move to approve Ordinance D on first reading.

ORDINANCE D

AN ORDINANCE AMENDING CHAPTER 12.12, MUNICIPAL CEMETERY, OF TITLE 12, STREETS AND OTHER PUBLIC PLACES, OF THE CODE OF THE TOWN OF JACKSON, WYOMING.

BE IT ORDAINED BY THE TOWN COUNCIL OF THE TOWN OF JACKSON, WYOMING:

SECTION I.

Section 12.12.065, Human Interment, of Chapter 12.12, Municipal Cemetery, of Title 12, Streets and Other Public Places, of the Code of the Town of Jackson, Wyoming, is hereby added as follows:

12.12.065 – Human Interment.

No person shall inter the dead body of a human being within the Town, unless such interment is made in the municipal cemetery in the manner provided by this chapter, including any rules and regulations of the Town enacted in accordance with this chapter and state statute.

SECTION II.

The penalty for violating any provision of this Ordinance is up to a maximum of $750.00 per day, per violation.

SECTION III.

All ordinances and parts of ordinances in conflict with the provisions of this Ordinance are hereby repealed.

SECTION IV.

If any section, subsection, sentence, clause, phrase, or portion of this Ordinance is for any reason held invalid or unconstitutional by any court of competent jurisdiction, such portion shall be deemed as a separate, distinct, and independent provision and such holding shall not affect the validity of the remaining portions of the ordinance.

SECTION V.

This Ordinance shall become effective after its passage, approval, and publication.

PASSED 1ST READING THE _____DAY OF _____ , 2025.

PASSED 2ND READING THE _____DAY OF _____ , 2025.

PASSED AND APPROVED THE _____DAY OF _____, 2025.

TOWN OF JACKSON

BY: _____

Arne O. Jorgensen, Mayor

ATTEST:

BY: _____

Riley Hovorka, Town Clerk

ATTESTATION OF TOWN CLERK

STATE OF WYOMING)

) ss.

COUNTY OF TETON)

I hereby certify that the foregoing Ordinance No. _____ was duly published in the Jackson Hole News and Guide, a newspaper of general circulation published in the Town of Jackson, Wyoming, on the _____day of _____, 2025.

_____

Riley Hovorka, Town Clerk

October 22, 2025

Senator John Barrasso
Senator Cynthia Lummis
Representative Harriet Hageman
Secretary Brooke Rollins, Department of Agriculture
Secretary Doug Burgum, Department of Interior
Acting Director Jessica Bowron, NPS
Chief Tom Schultz, USFS
Director Brian Nesvik, USFWS

Dear Leader

As we enter the fourth week of the federal government shutdown. we write for two reasons:

- To urge you to do all you can to reopen the federal government; and
- To help you understand how the shutdown is affecting our community and our constituents

We, the undersigned, form the town council of Jackson, Wyoming. Within our community lies all of Grand Teton National Park, the southern half of Yellowstone National Park, the National Elk Refuge, and portions of three different national forests. Visitors come from around the world to visit these majestic federal lands, and the sales taxes they pay form a significant portion of the Town of Jackson's annual budget (roughly 80% of the town's operating revenue comes from sales taxes).

In our most recent letter to you, we discussed how the government shutdown is harming our region's economy. Today, we'd like to discuss a much more personal issue: the effects the closure is having on the 400+ federal employees who live in Jackson Hole. These are our friends, neighbors, and constituents, and every passing day of closure makes their lives increasingly challenging.

Jackson Hole's federal lands are the crux of our region – ultimately, neither our economy nor community at large can be healthier than the lands surrounding us. As a result, the work Jackson Hole's federal employees do is absolutely vital not just to our public lands, but to our economy and community.

While federal employees represent fewer than 2% of Jackson Hole's workforce, their importance to our community's well-being is inestimably greater. Every day our federal employees are not working increases the threats to everything that makes our community special.

At least as important is the human toll the shutdown is taking on these several hundred people and their families. We as a community are doing everything we can to help them, but even these efforts are a poor substitute for the pride and stability that come with a job.

The longer the closure goes on, the worse the problems will be for our environment, community and economy. Because you are the fiduciaries of the asset that is our public lands, and because we are confident you share our goal of keeping the Town of Jackson and

the surround Tetons region not just healthy but thriving, we urge you to do all you can to, at a minimum, fully open our national parks, forests, and wildlife refuges. Ideally, your efforts will help reopen the entire federal government.

Thank you for your consideration

Very truly yours

Jackson Town Council

October 29, 2025

Senator John Barrasso
Senator Cynthia Lummis
Representative Harriet Hageman
Secretary Brooke Rollins, Department of Agriculture
Secretary Doug Burgum, Department of Interior
Acting Director Jessica Bowron, NPS
Chief Tom Schultz, USFS
Director Brian Nesvik, USFWS

Dear Leader

As we enter the fifth week of the federal government shutdown. we write for two reasons:

- To urge you to do all you can to reopen the federal government; and
- To help you understand how the shutdown is affecting our community and our constituents

We, the undersigned, form the town council of Jackson, Wyoming. Within our community lies all of Grand Teton National Park, the southern half of Yellowstone National Park, the National Elk Refuge, and portions of three different national forests. Visitors come from around the world to visit these majestic federal lands, and the sales taxes they pay form a significant portion of the Town of Jackson's annual budget (roughly 80% of the town's operating revenue comes from sales taxes).

In our most recent letter to you, we discussed how the government shutdown is harming our friends, neighbors, and constituents working for the federal government. Today, we'd like to pose a simple question to you: Will the federal government compensate the Jackson – our businesses, constituents, and the town itself – for the financial damage the shutdown is causing?

From 2019-2024, taxable sales generated in October by Jackson Hole's tourism economy grew from $42 million to $68 million, an increase of over 60%. Those sales generated nearly $3 million in revenue for the state of Wyoming, and roughly $2 million for Jackson Hole's local governments.

Before the shutdown began, Jackson Hole's national park-related tourism spending was running nearly 6% ahead of 2024's levels. Depending on how severe the government shutdown-related drops in tourism prove to be, in October alone the loss to Jackson Hole's businesses could total millions of dollars; the loss to state and local government could end up in the hundreds of thousands.

These losses would be concerning at any time. They are especially concerning now, though, as evidence mounts that our economy is slowing down. The federal government closure is making this problem worse, and its repercussions will increasingly harm our ability to address the growing challenges facing our community and region.

To this end, we urge you not only to do all you can to end the shutdown, but to make

sure any plan for ending it compensates local businesses and governments for closure-related losses.

Thank you for your consideration

Very truly yours

Jackson Town Council

MEMORANDUM

TO: Mayor and Town Council

FR: Tyler Sinclair, Town Manager

DT: October 20, 2025

RE: Town Manager's Report

Temporary Sign Permits

The Temporary Sign Permits for Council consideration at this meeting are:

- ✓ Jackson Hole Farmer's Market requests to hang one temporary banner for four occurrences at 105 Buffalo Way (Albertson's) from December 14-20, January 4-10, February 1-7, and March 8-14, 2025 to advertise various dates of their Winter Market (P25-188).

- ✓ Soroptimist of Jackson Hole requests to hang two temporary banners, one at 105 Buffalo Way (Albertson's) from November 23 – 29 & one at 750 W Broadway (The Virginian) from December 1 – 7, 2025 to advertise the Christmas Tree Festival (P25-190).

- ✓ Jackson Hole Art Association requests to hang two temporary banners at 920 W Broadway Ave (Jackson Hole Conference Center) from December 5-6, 2025 to advertise Holiday Bazaar (P25-192).

Staff recommends approval of these requests, and with the approval of the Town Manager's report, staff will issue the Temporary Sign Permits as requested.