STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION
BID PACKAGE

Sealed bids for construction of this project will be received by the Montana Department of Transportation, Construction Contracting Bureau, Room 101, 2701 Prospect, Helena, Montana until 9:00 a.m. on April 3, 2025. All bids will then be publicly opened, reviewed for correctness, and then publicly read.

Federal Aid Project(s):

IM 94-6(68)193 Bad Route Rest Area

Bid proposals, Plans, Standard Specifications, Detail Drawings, and Standard Contract Forms are on file for examination and may be obtained from the Construction Contracting Bureau of the Montana Department of Transportation, 2701 Prospect Avenue, P.O. Box 201001, Helena, Montana 59620-1001.

Prime bidders use the Electronic Bid System or bid on-line through Bid Express to produce a bid containing Proposal Forms, Schedule of Items, and Disadvantaged Business Enterprises (DBE) Requirements (if applicable).

CONTRACT #05125R
AWARDED ON: APRIL 15, 2025
TO: KH CIVIL CONTRACTORS, INC.

MONTANA DEPARTMENT OF TRANSPORTATION

Loran Frazier, Chairperson
Montana Transportation Commission

Christopher Dorrington
Director of Transportation

Contract No.05125R
EC:ST:9877000AWD

CURRENT QUESTIONS & ANSWERS

103 - BAD ROUTE REST AREA - April 03, 2025

Notifications
No Notices available for this project.

Amendments
No Amendments available for this project.

Clarifications
-1-
Submitted: Monday 10-MAR-2025 07:13 AM
This project is being re-advertised. Changes may have been made to the prior bid package. If you submitted a question when this project was previously advertised and believe your question is still applicable, please ask the question on the Q&A forum again. By doing so, your question and MDT's corresponding answer will become part of the contract.

Questions
-1-
Submitted: Friday 07-MAR-2025 09:08 PM
Company: MG Construction
Contact: Mike Goodale
The bid package plans are raster images can you provide a vector pdf?
Answer
Submitted: Friday 14-MAR-2025 11:08 AM
A vector pdf version of the plans can be viewed here at the following link: **BAD ROUTE PLAN SET**
-2-
Submitted: Friday 21-MAR-2025 09:53 AM
Company: Storm Water Construction, Inc.
Contact: Pat Bibeau
We are requesting a couple clarifications
1. Pavilion #3 Page. A9 Could you give us clarification on to wall framing and metal paneling that you are requiring for this
2. Could you please give clarity on the metal benches and tables for the pavilion and Kiosk area. (Dimensions, anchor system and suggested manufacturer)
3. Can you provide a product that you are requesting for mechanical room floor access door
Answer
Submitted: Friday 28-MAR-2025 08:17 AM
1. Wall type E-1 to be used per plan. use 24" oc stud spacing for non-load bearing walls. 26-gauge exterior metal siding, Basis of Design - Protech Steel, Low Pro
2. Basis of Design - Picnic Table - Premier Polysteel 8' Picnic Table, Direct Bury Multi Pedestal and the Benches are similar and are from the same manufacturer. Accessible Picnic Table | 20 Year Warranty | 100% Plastisol Coated [premierpolysteel.com]
3. Access Door basis of Design - Bilco Aluminum Type K & KD-Angle Frame to fit existing opening.
-3-
Submitted: Friday 21-MAR-2025 02:00 PM
Company: KH Civil Contractors
Contact: Mike Kindzerski
Plan page C-16 calls for "parking striping" and yellow curb paint for the new concrete median curb. Plan page A-2 calls for handicap parking striping and epoxy markings. There is no pay

item for any of this work. Can the appropriate pay items be added to the contract?
Answer
Submitted: Wednesday 13-MAR-2025 10:53 AM
Striping and curb paint will not be part of this project. Please disregard comments that state to install them with this contract as they will be installed on the Bad Route – SW project.

-4-

Submitted: Friday 21-MAR-2025 04:58 PM
Company: Storm Water Construction
Contact: Pat Bibeau
Slab and footing clarifications for pavilion and kiosks.
1. How thick are you requiring the gravel to be under the footings, columns and slabs?
2. What gradation are you specifying this gravel to be?
3. On page S-5. detail 1 doesn't show slab thickness or rebar layout required for pavilions or kiosk slab anywhere in plan set
Answer
Submitted: Friday 28-MAR-2025 08:27 AM
1. Please place footings in undisturbed native soil. For slab subgrade & basecourse – Compact subgrade to 95% standard proctor, followed by a 6” lift of 1.5” minus crushed base course per MPWSS Section 02235 and compacted to 95% standard proctor.
2. 1.5” minus crushed base course per MPWSS Section 02235
3. Please do a 4” concrete slab on grade w/ #3 @ 18” o.c.

-5-

Submitted: Tuesday 25-MAR-2025 08:54 AM
Company: Alpine Sign Inc
Contact: John
Please provide Sign Design Calculations for this project
Answer
Submitted: Tuesday 25-MAR-2025 03:26 PM
Sign Design Calcs are not available for this project, any sign designs needed for non-standard MUTCD signs will be provided in accordance with Subsection 619.03.2 post award.

MONTANA DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

CONTRACT ID: 05125R

PROJECT: IM 94-6(68)193 9877068000 BAD ROUTE REST AREA

SECTION: 0001 - REST AREA REHABILITATION

PROP LINE NO.	ITEM NUMBER	ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY
0010	104030010	MISCELLANEOUS WORK	UNIT	20,000.00
0020	104030011	MISCELLANEOUS ITEMS-LS	LS	1.00
0030	104030025	MISCELLANEOUS ITEMS-INSTALL	EACH	1.00
0040	104030030	MISCELLANEOUS ITEMS-INSTALL	LNFT	1,166.00
0050	104030045	MISCELLANEOUS ITEMS-EACH	EACH	4.00
0060	104030085	MISCELLANEOUS ITEMS-UNIT	UNIT	2.00
0070	109200005	MOBILIZATION	LS	1.00
0080	203020100	EXCAVATION-UNCLASSIFIED	CUYD	561.00
0090	208010000	BMP ADMINISTRATION-LS	LS	1.00
0100	208010200	TEMPORARY EROSION CONTROL-FIXED	UNIT	500.00
0110	401020023	COMMERCIAL MIX-PG 58-28	TON	45.00
0120	603012530	RCP 18 IN	LNFT	128.00
0130	603013458	PIPE-PVC 4 IN SANITARY	LNFT	35.00
0140	603013460	PIPE-PVC 6 IN SANITARY	LNFT	165.00
0150	604010184	CONCRETE APRON	EACH	2.00
0160	604010295	INLET STRUCTURE BASE 48 IN (1220 MM)	EACH	1.00
0170	604010302	MANHOLE STRUCTURE BASE 48 IN (1220	EACH	1.00
0180	604010306	MANHOLE STRUCTURE BASE 72 IN	EACH	1.00
0190	604010661	CURB INLET FRAME AND GRATE	EACH	2.00
0200	607000030	FENCE-CHAIN LINK 4 FT	LNFT	404.00
0210	607000260	GATE-CHAIN LINK	LNFT	8.00
0220	607150020	REMOVE CHAIN LINK FENCE	LNFT	254.00
0230	608010020	SIDEWALK-CONCRETE 4 IN	SQYD	1,067.00
0240	608010060	SIDEWALK-REINFORCED 6 IN	SQYD	298.00
0250	608010067	REMOVE SIDEWALK	SQYD	1,260.00
0260	608010125	DETEC WARNING DEVICES-TYPE 1	SQYD	2.00
0270	609010010	CURB-CONCRETE	LNFT	110.00
0280	609010030	CURB-CONC MEDIAN TYPE A	LNFT	185.00
0290	609010203	REMOVE CURB	LNFT	463.00
0300	610100557	REVEGETATION	ACRE	1.00

SECTION: 0001 - REST AREA REHABILITATION

PROP LINE NO.	ITEM NUMBER	ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY
0310	610501060	REHABILITATE BUILDING	LS	1.00
0320	610513200	BUILDING - MISC	LS	1.00
0330	613520010	VEGETATED CONCRETE BLOCK MAT	SQYD	76.00
0340	615010061	IRRIGATION STRUCTURE	EACH	1.00
0350	618030015	TRAFFIC CONTROL-FIXED	UNIT	500.00
0360	618030080	TRAFFIC CONTROL-LS	LS	1.00
0370	619010086	SIGNS-ALUM REFL SHEET IV	SQFT	4.50

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SPECIAL PROVISIONS

FEDERAL AID PROJECT NO(S). IM 94-6(68)193

(REVISED 4-03-25)

The following special provisions are hereby made part of the contract and supplement and/or supersede any sections of the Standard Specifications of Road and Bridge Construction, adopted by the Montana Department of Transportation and the Montana Transportation Commission and all supplements thereto in conflict therewith.

The following documents are hereby incorporated by reference into this contract:

- "Question and Answer Forum":

Question and Answer Forum

- "Standard Specifications for Road and Bridge construction":

Standard Specifications January 2025

- The most recent version of the Detailed Drawings:

Detailed Drawings

- The most recent version of the Materials Manual:

Materials Manual January 9, 2025

The latest version of the Standard Specifications, Biannual updates, and revision summaries can be found at the following website: Standard Specifications

The Question-and-Answer Forum opens at 5:00 p.m. on the bid letting advertisement date and closes at 10:00 a.m. on the Monday before the bid letting. If Monday is a state holiday, the forum will close on Friday before the bid letting at 3:00 p.m. Answers provided by the Department to the questions, clarifications, and notifications can be posted up to 5:00 p.m. on the day before the letting.

The U.S. Department of Transportation (DOT) operates a toll-free number at 1-800-424-9071, 24 hours a day - 7 days a week. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use this number to report such activities. All information will be treated confidentially, and callers may remain anonymous.

The Department attempts to provide reasonable accommodations for any known disability that may interfere with a person participating in any service, program, or activity of the Department. Alternate accessible formats of this document will be provided upon request. If reasonable accommodation is needed to participate in Department bid lettings, call the Civil Rights Bureau at 444-6331 or TTY 406-444-7696 [TTY 1-800-335-7592 (toll free)].

1. PROJECT DESCRIPTION [102]

The proposed project is for the rehabilitation of the existing Bad Route Rest Area to provide ADA, general maintenance improvements, and installation of a new wastewater treatment system. The work will include renovation of the existing bathrooms in the main building to include replacement of flooring, wall coverings, fixtures, plumbing, electrical, and HVAC. The project also includes improvements to the project site including renovation of the existing picnic shelters, removal and replacement of the existing sidewalks with ADA compliant sidewalks, resurfacing of the septic tank pumper access road, storm water improvements to the south side of the truck parking area including an inlet and storm water ditch to convey storm water around the wastewater drain fields, and replacement of the irrigation pump and a new pump building on top of the irrigation vault. The project will also remove the existing septic tanks and abandon the existing subsurface drain fields in place and replace the system with a new 10,000-gallon precast concrete septic tank, dosing manhole and pumps, and new zoned pressure dosed drain field system.

2. CONTRACT TIME [108] (REVISED 1-21-16)

The work begins on the effective date stated in the Notice to Proceed (NTP) and is to be completed in 100 Working Days. The NTP will be issued with an effective date of June 2, 2025.

3. CONTRACT DOCUMENTS [102] (REVISED 1-9-25)

The following documents are now available within the Contractors Reference Material on the Department's Contracting and Bidding webpage https://www.mdt.mt.gov/business/contracting/ :

1) Table of Contractor's Submittals. (Revised 3-7-24)
2) Traffic Control Rate Schedule (Revised 3-9-23)
3) Erosion Control Rates (Revised 1-09-25)

4. DISADVANTAGED BUSINESS ENTERPRISES (DBE) REQUIREMENTS [102] (REVISED 2-23-23)

The DBE goal for this contract is 0.00%. Use the AASHTOWare Project BidsTM Electronic Bid System (EBS) to print the DBE submittal and timing requirements. If the contract does not have a project-specific goal, the field will display in the AASHTOWare Project BidsTM bid file as a blank field.

List the DBE commitments in the EBS file. An on-line DBE Directory is available at: https://app.mdt.mt.gov/ess-dbe/.

If the DBE goal cannot be met, show a good faith effort per the Good Faith Effort Criteria and supporting forms, available at: http://www.mdt.mt.gov/publications/forms.shtml. Submit the Good Faith Effort documentation within 48 hours of the bid opening.

5. DBE USAGE [102] (REVISED 11-16-23 M)

Contract specific goals are not placed on contracts; however, the Department has an overall 6.3% DBE goal it must achieve. To assist contractors in determining their DBE commitment level, the Department has reviewed the estimates for this contract and has established an aspirational goal of 9.8% DBE usage. Although not a contract requirement, the Department believes that the aspirational goal can realistically be achieved through race neutral measures based on current availability of DBEs and standard competitive procurement processes. While the utilization is not mandatory to be awarded the project, continuing utilization of DBE firms on contracts supports the success of Montana's DBE Program.

Any project listing a 0% DBE aspirational goal does not mean that a DBE may not be used on that project. A 0% DBE aspirational goal may have been established due to any of the following reasons:

- Limited identified subcontracting opportunities;
- Minimal contract days; and/or,
- Small contract dollar amount.

Contractors are encouraged to identify any opportunities to subcontract to DBEs.

The Department's DBE directory may be found at the following website: https://app.mdt.mt.gov/ess-dbe/.

6. LABOR REQUIREMENTS [102] (REVISED 9-19-24)

Pay the minimum wage rates contained elsewhere in the bid package. Comply with the required contract provisions contained in the form FHWA 1273 included with this contract. To obtain more information, contact the Department's Construction Engineering Services Bureau at 2701 Prospect, Helena, MT (406)475-2258, (800)335-7592 (TTY) or (406)444-7297 (Fax).

Executive Orders 13658 and 13706 do not apply to this contract.

7. NEW SUBCONTRACTORS [102] (ADDED 4-04-24)

The contract amount will be increased by a maximum of $10,000 via change order if the Prime Contractor uses a DBE or SBE certified firm that has not worked on a federal-aid MDT contract in the past three years. The incentive amount will be applied in accordance with the following table.

Subcontract Amount	Added Contract Amount
≤ $15,000	$1,000
$15,001-$50,000	$2,500
$50,001-$100,000	$5,000
≥ $100,000	$7,500

Note: The table is representative for one subcontract.

Payment will be made once the subcontract has been fully executed and will be paid under the bid item NEW DBE-SBE INCENTIVE.

8. SMALL BUSINESS ENTERPRISES REQUIREMENTS [102] (ADDED 5-16-24)

Rescind "DBE requirements" and replace with "DBE and SBE requirements" within the following subsections:

1) 102.02 Contents of Bid Package.
2) 102.07 Bidding Requirements.
3) 102.08J Rejection of Bid Proposal.

9. PARTNERING [105] (ADDED 1-11-24 M)

In accordance with Subsection 105.05.1, this contract requires Level (II) facilitation.

10. STEEL PRICE ADJUSTMENT [106] (REVISED 11-14-24)

In accordance with Subsection 106.09.1, the base price per pound of steel for this contract is: $1.05.

11. BUILD AMERICA, BUY AMERICA (BABA) [106] (REVISED 1-11-24)

Furnish construction materials manufactured in the United States. Construction materials include articles, materials, or supplies that are or consist primarily of:

- Non-ferrous metals.
- Plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables).
- Glass (including optic glass).
- Fiber optic cable (including drop cable).
- Optical fiber.
- Lumber.
- Drywall, and
- Engineered wood.

Construction materials exclude cement and cementitious materials, aggregates including stone, sand, or gravel, or aggregate binding agents (e.g., asphalt binder) or additives (e.g., polymer modifiers and admixtures).

Manufacturing processes for the construction material must occur in the United States. Manufacturing processes for each of the bulleted construction materials above are defined in 2 CFR 184.6 and are summarized below.

a) Non-ferrous metals: Initial smelting or melting through final shaping, coating, and assembly.

b) Plastics: Initial combination of plastic, polymer based, or composite materials until item is in its final form.

c) Glass: Initial batching and melting, annealing, cooling, and cutting.

d) Fiber Optic Cable: Initial ribboning, buffering, and fiber stranding and jacketing.

e) Optical Fiber: Initial preform fabrication through completion of draw.

f) Lumber: Initial debarking, treatment, and planing.

g) Drywall: Initial blending of gypsum, cutting, and drying of sandwiched panels.

h) Engineered Wood: Initial combination of constituents until item is in its final form.

BABA preference applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to a project. It does not apply to tools, equipment, and supplies brought to the construction site and removed at or before the completion of the project (e.g., temporary aluminum scaffolding). Buy America preference does not apply to equipment and furnishings that are used at or within the finished infrastructure project but are not permanently affixed to the structure (e.g., movable chairs, desks, or computer equipment used at or within the project but are not integral or permanently affixed to a structure).

2 CFR 184 applies to all construction materials on projects receiving federal financial assistance funds. Submit Form MDT-MAT-407 “Manufacturer’s Certificate of Compliance” for every material identified as a construction material in the Department’s Materials Manual Section MT 601 furnished to the project. For all other materials, documentation will be required upon request. Do not incorporate construction materials into the project until all required documentation is submitted to the Department. Ensure that suppliers and manufacturers understand the BABA and contract requirements to supply the required documentation.

The Department will not accept items installed until all supporting documentation has been reviewed and is found to be in accordance with the contract requirements. Insufficient or unavailable documentation or documentation showing products containing construction materials of foreign origin are grounds for removal and replacement at the contractor’s expense.

The Department has designated contract materials as “construction materials” by their respective 9-digit material codes in section MT 601 of the Montana Materials Manual. However, the Department recognizes there will be situations where a product or material may not fit the designation indicated in section MT 601. In these cases, submit documentation demonstrating or justifying the supplier or manufacturer’s position that their specific item has been misclassified to the Project Manager at least 10 business days in advance of installation. The Department, in conjunction with FHWA, will review the submitted documentation and decide as to how that specific product or material will be classified. These determinations will be final and will require the appropriate necessary documentation as defined above.

The US DOT has found that it is in the public interest to issue a waiver of BABA’s domestic preferences in certain situations. For Construction Materials, the domestic preference may be waived if the total value of non-compliant material is under $1,000,000 or 5% of the total applicable project costs, whichever is less. Submit actual individual material costs, minus manufacturing costs outside the defined manufacturing processes outlined above, along with justification in the form of invoices, bills of lading, or other appropriate documents to the Department if requesting the waiver.

The above waiver does not apply to iron and steel and the existing de minimis standard for iron and steel under 23 CFR 635.410(b)(4) continues to apply.

Projects with a total contract value of $500,000 or less are exempt from all domestic preference regulations including steel and iron.

12. SUBCONTRACTING CONSULTANTS [108] (REVISED 2-27-14 M)

The following consultants performed work on the project.

- WWC engineering

13. SPECIALTY ITEMS [108] (ADDED 4-15-08)

The project has work items that are specialty items as defined in 23CFR635.102. Specialty items are listed in the following table.

TABLE 108-2 SPECIALTY ITEMS	
Eliminite Level 2 Treatment System	

14. NOTICE TO BIDDERS [108] (ADDED 11-21-08)

This project is funded in whole or in part by funds received from the Federal Highway Administration (FHWA), and its construction is wholly contingent on the state's continued receipt of those federal funds. If the federal funds are reduced or not received, the Department may choose to terminate the contract for convenience under the provisions of Subsection 108.10. Any bidder on this project, by submitting its bid, understands and accepts the possibility of the contract being terminated in the event federal funds are reduced or not available and by submitting a bid, each bidder waives any claims for costs or damages other than as specifically allowed by Subsection 108.10.2. In particular, bidders understand and accept that no payment will be allowed for any claimed anticipated profit for work not performed.

15. STORM WATER PERMITTING REQUIREMENTS UNDER THE MT POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES) [208] (REVISED 8-10-23)

A. Description. The DEQ regulates storm water discharges under the MPDES program. If the bid package contains blank erosion control plans, a construction storm water discharge permit authorization will be required. If not, a storm water discharge permit authorization may be required for this project depending on Contractor's operations. Sum the disturbance area (as defined by DEQ) identified in the contract with the area of disturbance caused by contractor operations to determine if the permit acreage threshold is exceeded. Contractor operations can include, but are not limited to, the following support activities: staging areas, access roads, material storage areas, temporary concrete, or asphalt batch plants, borrow areas, areas used for fill placement, etc. If the summed disturbance area is one acre or more, use the DEQ authorization to discharge under the MPDES General Permit for Storm Water Discharges Associated with Construction Activity (General Permit) for this project. In order to facilitate permit transfer, separate NOI packages are required for areas within the right-of-way and areas outside of the right-of-way. A NOI package includes a Notice of Intent, with a topographic map, a SWPPP, the erosion control plans, sage grouse consultation letter, if applicable, and supporting documentation.

Blank Erosion Control Plans, and a topographic map, are provided with the plans if the plans include greater than 1 acre of disturbance. Complete the erosion control plans as required by the general permit. Complete the SWPPP using DEQ's most current SWPPP Form.

B. Materials. Follow the requirements described in the Department's *Erosion and Sediment Control Best Management Practices Manual (December 2016).* Rescind Section 208 detailed drawings. Submit to the Project Manager for review and acceptance BMPs proposed for use that are not included in the Manual.

C. Construction Requirements.

1) MPDES Permit Required.

a) Submit one NOI package and the associated fees to DEQ for ground disturbance areas shown in the plans or within the right-of-way. For ground disturbance areas shown in the plans and any other areas within the right-of-way where Contractor activities causing ground disturbance are planned, the Contractor is the sole permittee until construction is complete and the General Permit is transferred to the Department or another entity.

The Department is not responsible for delays caused by incomplete or inaccurate submittals by the Contractor.

Comply with the requirements of the General Permit and implement the SWPPP. Provide an electronic copy of the NOI Package submitted to DEQ and confirmation for receipt of a complete NOI Package from DEQ to the Project Manager prior to conducting any ground disturbance activities.

Do not begin construction activities until the required copy of the NOI Package submitted to DEQ and confirmation for receipt of a complete NOI Package from DEQ is received by the Project Manager.

b) Furnish and install public signage as required by the General Permit. Include the cost of the required sign(s) in the Temporary Erosion Control Lump Sum bid item. Submit a separate NOI package and the associated fees to DEQ for ground disturbance and support activity areas outside the right-of-way and not shown in the plans. Contractor furnished material sources, staging areas, plant sites, or any other Contractor caused ground disturbance outside the right-of-way and not shown in the plans, are the Contractor's responsibility and must be submitted under a separate NOI package from the ground disturbance within the right-of-way. For all support activities outside the right-of-way which are not part of a larger commercial operation serving multiple unrelated construction activities and will not continue operation beyond the completion of the contracted road construction activity, a notice of intent package must be submitted to DEQ to obtain an authorization under the General Permit. Sand and gravel borrow area operations, gravel pits, and/or concrete batch plants that will continue operation beyond the completion of the contracted road project, are part of a larger commercial operation, or serving multiple unrelated construction activities, must obtain permit coverage under the Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activity (MSGP) regardless of acreage size of the activity if the activity does not already have MSGP authorization. The Contractor is the sole permittee until stabilization is complete and the General Permit is terminated or transferred to another entity. The Department is not responsible for delays caused by incomplete or inaccurate submittals to DEQ by the Contractor.

Provide copies of all NOI Packages submitted to DEQ and confirmations for receipt of complete NOI Packages from DEQ to the Project Manager prior to conducting any ground disturbance activities.

Be responsible for all temporary erosion, sediment, and pollution prevention controls for Contractor furnished material sources, staging areas, plant sites, or any other Contractor caused ground disturbance outside the right-of-way and not shown in the plans.

c) Complete and document all inspections in accordance with the requirements of the General Permit. Use DEQ's most current self-inspection form available online at: https://deq.mt.gov/files/Water/WQInfo/Documents/WPBForms/2023-Attachment-B-MTR100000.pdf. Provide a copy of all inspection reports to the Project Manager within 7 calendar days of the inspection.

Report potential noncompliance in accordance with applicable regulations, guidance, and permit conditions. Submit to the Project Manager within 7 calendar days of sending or receiving all correspondence to or from regulatory agencies regarding potential noncompliance or violations.

The temporary erosion and sediment control measures and devices to prevent pollution and control sediment transport and soil erosion will be inspected as part of the final inspection to ensure they are maintained and functioning properly. Do not transfer or terminate the General Permit coverage until the BMPs are inspected and accepted and all records required under the permit, including inspection and monitoring reports, are furnished to the Project Manager and authorization is received from the Department. The Department may require that certain BMPs be replaced by another type of BMP as a condition of permit transfer.

Upon approval of site conditions, measures, devices and all pertinent records, the Department will notify the Contractor to begin the Permit Transfer Notification in DEQ FACTS. Once completed, provide verification that all fees have been paid and the permit is ready for transfer in DEQ FACTS. The Department is not liable for the completeness or accuracy of Contractor records completed prior to the permit transfer. Ensure permit conditions and responsibilities are met until confirmation of the transfer is received from DEQ. Defend and hold the Department harmless from any violations, claims, enforcement actions, penalties or fines issued for Contractor activities or recordkeeping that occurred prior to the transfer of the General Permit.

If the Department concurs that final stabilization has been met during the final walk-through, the Contractor may submit a Notice of Termination form to DEQ. Pay the annual fee

invoice due at the time of termination. Submit the annual fee invoice to the Project Manager for reimbursement.

2) MPDES Permit not Required.

The BMP-Administration item is included in contracts that may not meet either criteria for an MPDES permit but include ground disturbing activities. Complete BMP inspections and install BMPs, if necessary, in accordance with Section 208, if no storm water permit is required. Utilize form MDT-ENV-014, Water Pollution Control Inspection Report. A certified SWPPP Administrator is not required to conduct the inspections if no permit is required.

D. Method of Measurement. DEQ MPDES fees and monitoring costs associated with obtaining and maintaining the General Permit for ground disturbance areas both within and outside the right-of-way are not measured separately for payment.

If no permit is necessary, include the cost of all erosion control, devices, and inspections in the BMP-Administration bid item.

E. Basis of Payment. No additional payment will be made for the DEQ MPDES fees and monitoring costs associated with the General Permit. Include these costs in the Temporary Erosion Control-Lump Sum bid item.

For project including the BMP-Administration item, include the cost of all erosion control, devices, and inspections in the BMP-Administration bid item. Partial payment for the BMP-Administration will be monthly based on the lump sum contract price in accordance with Table 208-2 in Subsection 208.05.1.

Payment for BMPs required by an event or extra work, and approved by the Project Manager, will be measured and paid for in accordance with the Erosion Control Rate Schedule contained in the contract at a unit price of $1.00 per unit.

16. PUGMILL MIXING [301] (ADDED 1-1-03)

Pugmill mixing of surfacing aggregates called for in Subsection 301.03.5 B is not required for this contract.

17. TRAFFIC CONTROL PLAN & SEQUENCE OF OPERATIONS

A. Traffic Control. Establish traffic control to complete the work. It is expected the rest area will be closed to complete work on the project. Ensure that the traffic control meets the requirements of the Manual of Uniform Traffic Control Devices (MUTCD) and MDT Detailed Drawings. Use methods that minimize disruption to vehicular and pedestrian traffic through the site. Devices used shall provide reflective panels and sheeting suitable for nighttime visibility from oncoming vehicle traffic and arranged to take into account the speed of the vehicle approaching the site being delineated. Provide temporary traffic control signing along the interstate notifying the public that the rest area is closed for maintenance.

B. Stockpile and Storage. Provide traffic control devices and barriers to safely direct traffic around and prevent unauthorized entry into stockpile and storage sites and work zones.

C. Traffic Control & Sequence of Operations Plan. Prepare the traffic control & sequence of operations plan according to the requirements to construct the project. Provide the plan to the Project Manager a minimum of three weeks prior to mobilization for the Department's review and approval. Make corrections to the plan as directed by the Department through the Project Manager. Do not begin work until receiving an approved plan back from the Project Manager. The Project Manager may restrict or halt contract work at any time he or she determines that the plan does not meet the requirements of this provision. The plan and sequence of operations may need to be modified during the course of the project, if determined by the Project Manager, that a revision to the plan is in the benefit of the traveling public. The plan shall take into consideration that the rest area will be closed during work. Once work on the project is complete the rest area shall be opened to the public. In addition, the plan and potential modifications to the plan shall take into consideration coordination with other work as further described in this provision.

D. Measurement and Payment. Refer to the special provision title Measurement and Payment.

18. GROUNDWATER & DEWATERING

Groundwater may be encountered when excavating for wastewater system components. Review the project geotechnical evaluation reference and make appropriate provisions for groundwater and necessary dewatering. Previous studies have indicated that groundwater is not located at shallow depths or rises to the ground surface during seasonal variations; however, groundwater levels fluctuate over the years and even over the seasons. All excavations that experience groundwater need to be dewatered properly and kept dry at all times. Submit to the Project Manager, for approval, a de-watering plan for installing any structure before starting the work. Provide a plan meeting the requirements of the provision titled Authorization to Discharge Under The Montana Pollutant Discharge Elimination System (MPDES).

19. EXISTING SPRINKLER AND IRRIGATION SYSTEMS

A. Description. Existing sprinkler and/or irrigation systems exist at the rest area site. Do not damage existing sprinkler and/or irrigation systems that are not in conflict. Remedy any damage to systems caused by project activities to the Project Manager's satisfaction.Repair damaged irrigation components in conflict with the work or by contractor negligence with in-kind components. Prior to work that may damage the irrigation systems, coordinate with Project Manager for approval of location and materials. All irrigation facilities are to be activated and adjusted, if necessary, after construction activities are complete to ensure a leak-free fully operational system, and spray patterns meet Project Manager approval.

B. Payment. If damage is caused to sprinkler irrigation systems that are not in conflict with the proposed work, assume all costs associated with the system repair or replacement of damaged components with no expense to the Department.

Payment for sprinkler and/or irrigation systems in direct conflict with the proposed work will be as Miscellaneous Work, including all labor and materials for an operational system. Document all labor and material costs for approval by the Project Manager for payment.

20. REVEGETATION

A. Description. This work consists of providing the necessary equipment and materials to accomplish revegetation of all areas disturbed by construction activities, and/or as directed by the project manager.

B. Materials.

1) Pollinator signs as shown on the plans.

2) Landscaping Seed. Furnish a locally adapted blended lawn turf mix for disturbed lawn areas.

3) Reclamation Seed. Furnish the following seed mix for the drainfield pollinator planting area. Use substitute species only if the recommended species is not available and substitution is approved by MDT's reclamation specialist.

Reclamation Seed Mixture for Pollinator Habitat			Drill Seeding Rate		
Scientific Name	Common Name	Variety	PLS / sq. ft.	% of Mix	Pounds PLS/ acre
Elymus trachycaulus	Slender wheatgrass	Pryor	2	3	0.5
Poa secunda	Canby bluegrass	Canbar	4	8	0.2
Schizachyrium scoparium	Little bluestem	Badlands, Camper or Blaze	6	12	1.0

		Grass Subtotal	12	23	1.7
Gaillardia aristata	Blanketflower	Common	2	4	0.5
Linum lewisii	Lewis Flax	Appar	3	5	0.4
Ratibida columnifera	Prairie coneflower	Common	3	5	0.2
Echinacea angustifolia	Purple coneflower	Common	4	9	1.5
Rudbeckia hirta	Black-eyed Susan	Common	8	16	0.2
Cleome Serrulata	Rocky Mountain Beeplant	Common	2	3	1.0
Helianthus maximiliani	Maximilian Sunflower	Prairie Gold or Medicine Creek	3	6	0.5
Vicia americana	American Vetch	Common	5	9	6.0
		Forb Subtotal	30	57	10.3
Asclepias syriaca	Common Milkweed	Common	5	10	3.0
Asclepias speciosa	Showy Milkweed	Common	5	10	3.0
		Milkweed Subtotal	10	20	6.0
		GRAND TOTAL	52	100	18.0

C. Construction Requirements.

1) Salvage sufficient quantities of topsoil to place 4 inches over disturbed areas.

2) Reclamation Seeding for pollinator habitat in drain field area.

a) Prepare a firm, weed free seedbed suitable for drill seeding.

b) Drill seed with a conservation seeder, native seed drill or no-till drill equipped with small seed or legume boxes, and planting depth control for small seeds. If required for proper calibration, use separate seed boxes for grass, forbs and/or milkweeds and an inert filler such as rice hulls.

	Method	Seeding Depth	Season of Seeding
All Areas	Drill Seed	1/8 - 1/4 in	10/15 — 5/15

3) Lawn areas can be broadcast seeded with landscaping seed at dealer specified rates. Following broadcast seeding, scarify the areas to incorporate the seed into the upper ¼ to ½ inch of soil.

D. Basis of Payment. Topsoil salvage, placement, and seeding are paid for as REVEGETATION at the Contract unit price per acre.

21. MEASURMENT AND PAYMENT

A. Description. For the purposes of this project, this Measurement and Payment Section is intended to supplement Section 109.

B. Bid Items. No item that is required by the project for the proper and successful completion of the work, for the project, to meet the requirements, will be paid for outside of or in addition to the prices submitted in the Bid Proposal. All work not specifically set forth as a pay item in the Bid Proposal is considered a subsidiary obligation of the Contractor and all costs in connection therewith are to be included in the prices bid.

C. Measurement and Payment Bid Item Descriptions.

1) Miscellaneous Work. Measurement and Payment is as specified in 104.04 as directed by the Project Manager. In addition, these provisions identify payment for sprinkler and/or irrigation systems in direct conflict with the proposed work as Miscellaneous Work.

2) Miscellaneous Items - LS – Lump Sum. Measurement and payment for this bid item is to furnish and install new Eliminite Level 2 treatment system in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) All equipment and labor to install new Eliminite Level 2 treatment system.

b) Excavation and preparation of site for installation of new precast tanks.

c) Preparation of subgrade in accordance with plans and specifications.

d) All equipment, labor and materials to furnish and install base gravel in accordance with plans and specifications.

e) All equipment, labor, and materials to furnish and install precast concrete tanks in accordance with the plans and specifications. Prior to backfill precast concrete septic tanks shall be tested for water tightness in accordance with ASTM C1244, “Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill”.

f) All equipment, labor, and materials to furnish and install tank backfill in accordance with the plans and specifications.

g) All equipment, labor, and materials to restore all surface conditions as necessary to original or better condition shall be included in the unit price bid.

h) All equipment, labor, and materials to install pumps, electrical, controls, alarms and other miscellaneous work for the function of the Eliminite system in accordance with the plans and specifications.

3) Miscellaneous Items - Install – Each. Measurement and payment for this bid item is to furnish and install new 10,000-gallon precast concrete septic tank in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) All equipment and labor to pump existing waste material from existing septic tanks.

b) Transportation and disposal of waste material at an approved facility that accepts septic tank waste. Transportation and disposal of removed materials are considered incidental and shall be included in the unit bid price.

c) Excavation of material to base of existing septic tanks.

d) All equipment and labor to remove and dispose of the existing concrete septic tanks. Transportation and disposal of removed materials are considered incidental and shall be included in the unit bid price.

e) All equipment and labor to remove and dispose of existing septic tanks ballast. Transportation and disposal of removed materials are considered incidental and shall be included in the unit bid price.

f) Excavation and preparation of site for installation of new precast concrete septic tank.

g) Preparation of subgrade in accordance with plans and specifications.

h) All equipment, labor and materials to furnish and install base gravel in accordance with plans and specifications.

i) All equipment, labor, and materials to furnish and install 10,000-gallon precast concrete septic tank in accordance with the plans and specifications. Prior to backfill precast concrete septic tanks shall be tested for water tightness in accordance with ASTM C1244, “Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill”.

j) All equipment, labor, and materials to furnish and install tank backfill in accordance with the plans and specifications.

k) All equipment, labor, and materials to restore all surface conditions as necessary to original or better condition shall be included in the unit price bid.

l) All equipment, labor, and materials to install solar high-water alarm in accordance with the plans and specifications.

4) Miscellaneous Items - Install – LNFT. Measurement and payment for this bid item is to furnish and install two submersible pumps, two 3-inch PVC force mains from dose manhole

to multi-zone valves, and four 3-inch PVC force mains from the multi-zone valves to the first ball valve of each drain field in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) All equipment, labor and materials to furnish and install new 3-inch PVC pipe in locations identified on the plans.

b) All equipment, labor and materials to connect to pumps located in dose manhole including all fittings.

c) All equipment, labor and materials to furnish and install pipe bedding and backfill in accordance with the plans and specifications.

d) All equipment, labor and materials to restore surface conditions as necessary to original or better condition shall be included in the unit price bid.

5) Miscellaneous Items – Each. Measurement and payment for this bid item is to furnish and install four (4) pressure dosed drain fields from the first ball valve in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) All equipment, labor and materials to furnish and install new pressure dosed drain fields in locations identified on the plans.

b) All equipment, labor and materials to connect to 3-inch PVC force main including all fittings.

c) All equipment, labor and materials to furnish and install pipe bedding and backfill in accordance with the plans and specifications.

d) All equipment, labor and materials to furnish and install drain field laterals including chambers, pipe, bedding, and backfill in accordance with the plans and specifications.

e) All equipment, labor and materials to restore surface conditions as necessary to original or better condition shall be included in the unit price bid.

6) Miscellaneous Items – Unit. Measurement and payment for this bid item is to furnish and install two (2) multi-zone valves for the wastewater treatment system in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) All equipment, labor and materials to furnish and install new multi-zone valves in locations identified on the plans.

b) All equipment, labor and materials to connect to 3-inch PVC force main including all fittings.

c) All equipment, labor and materials to furnish and install vault, blue board insulation, and gravel base in accordance with the plans and specifications.

d) All equipment, labor and materials to restore surface conditions as necessary to original or better condition shall be included in the unit price bid.

7) Excavation-Unclassified. Measurement and Payment is as specified in Subsection 203.04 as directed by the Project Manager.

8) Commercial Mix – PG 58-28. Measurement and Payment is as specified in Subsection 302.04 as directed by the Project Manager.

9) RCP IRR 18 In Class 3. Measurement and Payment is as specified in Subsection 603.04 as directed by the Project Manager.

10) Pipe-PVC 4 IN – LNFT. Measurement and payment for this bid item is as described in the specifications. The measurement and payment include the cost of the following as identified in the plans to a complete installation:

a) All equipment and labor to remove the existing PVC sections of sewer pipe identified on the plans. Trench excavation shall be included in the unit bid price. Transportation and disposal of removed materials are considered incidental and shall be included in the unit bid price.

b) All equipment, labor and materials to furnish and install new 4-inch PVC pipe in locations identified on the plans.

c) All equipment, labor and materials to connect to the existing line and new septic tank including all fittings.

d) All equipment, labor and materials to furnish and install pipe bedding and backfill in accordance with the plans and specifications.

e) All equipment, labor and materials to restore surface conditions as necessary to original or better condition shall be included in the unit price bid.

11) Pipe-PVC 6 IN Sanitary – LNFT. Measurement and payment for this bid item is as described in the specifications. The measurement and payment include the cost of the following as identified in the plans to a complete installation:

a) All equipment, labor and materials to furnish and install new 6-inch PVC pipe in locations identified on the plans.

b) All equipment, labor and materials to connect to new septic tank including all fittings.

c) All equipment, labor and materials to furnish and install pipe bedding and backfill in accordance with the plans and specifications.

d) All equipment, labor and materials to restore surface conditions as necessary to original or better condition shall be included in the unit price bid.

12) Manhole – 48 In (1220 MM) Type 1. Measurement and Payment is as specified in Subsection 604.04 as directed by the Project Manager.

13) Manhole – 72 In (1830 MM) Type 3. Measurement and Payment is as specified in Subsection 604.04 as directed by the Project Manager.

14) Inlet Curb – Type A. Measurement and Payment is as specified in Subsection 604.04 as directed by the Project Manager.

15) Inlet Frame and Grate - Replace. Measurement and Payment is as specified in Subsection 604.04 as directed by the Project Manager.

16) Fence – Chain Link 4-ft. Measurement and Payment is as specified in Subsection 607.04 as directed by the Project Manager.

17) Gate – Chain Link. Measurement and Payment is as specified in Subsection 607.04 as directed by the Project Manager.

18) Remove Chain Link Fence. Measurement and Payment is as specified in Subsection 607.04 as directed by the Project Manager.

19) Remove Sidewalk. Measurement and payment for this bid item is the demolition and disposal of existing concrete sidewalks and surfaces in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) Remove existing concrete is as specified in the Subsection 202.04 as directed by the Project Manager.

20) Sidewalk – Concrete 4 In. Measurement and payment for this bid item is the construction of new concrete sidewalk and ADA ramps in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) Construct new concrete sidewalk and surfaces as specified in Subsection 608.04 as directed by the Project Manager.

21) Sidewalk – Reinforced 6 In. Measurement and payment for this bid item is the construction of new 6-inch reinforced concrete sidewalk in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) Construct new concrete sidewalk and surfaces as specified in Subsection 608.04 as directed by the Project Manager.

22) Concrete 4 In. Measurement and Payment is as specified in Subsection 608.04 as directed by the Project Manager.

23) Detec Warning Devices – Type 1. Measurement and Payment is as specified in Subsection 608.04 as directed by the Project Manager.

24) Curb - Concrete. Measurement and Payment is as specified in Subsection 609.04 as directed by the Project Manager.

25) Curb – Conc Median Type A. Measurement and Payment is as specified in Subsection 609.04 as directed by the Project Manager.

26) Remove Curb. Measurement and Payment is as specified in Subsection 202.04 as directed by the Project Manager.

27) Seeding Area No 1. Measurement and Payment is as specified in Subsection 610.04 as directed by the Project Manager.

28) Revegetation. Measurement and payment for this bid item is as described in the specifications. The measurement and payment include the cost of the following as identified in the plans to a complete installation:

a) All equipment, labor and materials to furnish and install revegetation for reclamation of the drain field area in accordance with the special provision.

29) Riprap – Class 1 Random. Measurement and Payment is as specified in Subsection 613.04 as directed by the Project Manager.

30) Block Mattress. Measurement and payment for this bid item is to install vegetative concrete block mats at inlets and outlets of the stormwater pond in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) Measurement and Payment is as specified in Subsection 613.04 as directed by the Project Manager.

31) Irrigation Structure. Measurement and payment for this bid item is to remove existing piping, pumps, and miscellaneous items from the irrigation vault and furnish and install new pump, piping, fittings, and pump building in accordance with the plans and specifications. The measurement and payment will include the cost of the following:

a) All equipment and labor to remove and dispose of the existing irrigation pump, piping, and miscellaneous items within the vault as identified in the plans and specifications. Transportation and disposal of removed materials are considered incidental and shall be included in the unit bid price.

b) All equipment, labor and materials to furnish and install new irrigation pump, piping, fittings, and pump building in accordance with plans and specifications.

32) Signs – Alum Refl Sheet IV. Measurement and Payment is as specified in the Subsection 619.04 as directed by the Project Manager.

33) Striping – White Epoxy. Measurement and Payment is as specified in the Subsection 620.04 as directed by the Project Manager.

34) Rehabilitate Building – Lump Sum. Measurement and Payment for this bid item is for the complete construction of the renovation of the existing restroom building, the renovation/replacement of four pavilions, removal of existing sign kiosk, install new sign kiosk, relocate historical markers, removal and replacement of trash cans, installation of new benches, installation of new lighting, and installation of security cameras in accordance with the plans and specifications. The measurement and payment includes the cost of the following in accordance with the plans and specifications:

a) Complete clearing and grubbing of the planned construction as required to prepare the site for excavation and embankment work. Load, Haul and dispose of cleared and grub material at a location chosen by the Contractor off the project site and approved by the Project Manager.

b) Salvage and stockpile topsoil. Replace the topsoil on to the finished slopes of the graded areas at the conclusion of embankment and finish grading operations, prior to seeding and fertilizing.

c) Demolition of interior restroom building appurtenances in accordance with the plans and specifications. Transportation and disposal of removed materials are considered incidental and shall be included in the unit bid price.

d) Demolition of existing pavilions in accordance with the plans and specifications. Transportation and disposal of removed materials are considered incidental and shall be included in the unit bid price.

e) Demolition of existing kiosk and trash cans in accordance with the plans and specifications.

f) Removal and reset existing historical signs in accordance with the plans and specifications.

g) All miscellaneous excavation to the grades and elevations required.

h) Dewatering if required.

i) Stockpiling excavation material for backfill.

j) Furnishing and installing shoring support for excavation walls if required.

k) Preparing the excavation foundation to receive footing forms.

l) Furnishing, place and strip all formwork.

m) Constructing the renovations to the restroom building in accordance with the plans and specifications.

n) Furnishing and installing all exterior and interior building appurtenances, fixtures and building mechanical, electrical, plumbing, and video security in accordance with the plans and specifications.

o) Backfilling, compacting and finish grading.

p) Complete installation, startup, operations and testing of mechanical, electrical, plumbing, and video security components.

q) Renovation of Pavilion 2 in accordance with the plans and specifications.

r) Installation of Pavilions 1, 3 and 4 in accordance with the plans and specifications.

s) Installation of new trash cans, benches, and kiosk in accordance with the plans and specifications.

t) Final As-Built and O & M manuals.

u) All other work and materials required, but not otherwise identified herein, to provide a completed project.

35) Storage Building. Measurement and Payment for this bid item is for the complete installation of a new prefabricated storage shed including concrete pad and ramp in accordance with the plans and specifications. The measurement and payment include the cost of the following in accordance with the plans and specifications:

a) Complete clearing and grubbing of the planned construction as required to prepare the site for excavation and embankment work. Load, Haul and dispose of cleared and grub material at a location chosen by the Contractor off the project site and approved by the Project Manager.

b) Salvage and stockpile topsoil. Replace the topsoil on to the finished slopes of the graded areas at the conclusion of embankment and finish grading operations, prior to seeding and fertilizing.

c) Constructing the concrete pad in accordance with the plans and specifications.

d) Furnishing and installing prefabricated storage shed building in accordance with the plans and specifications.

e) Furnish and install access ramp into shed in accordance with the plans and specifications.

f) All other work and materials required, but not otherwise identified herein, to provide a completed project.

36) Traffic Control - LS. Measurement and Payment for this item is by the Lump Sum to include the cost of completing the work in accordance with the provision titled Traffic Control Plan & Sequence of Operations.

22. ASBESTOS ABATEMENT AND DEMOLITION NOTIFICATION

A. Description: Prior to demolition or renovation of structures in Montana, an inspection and notification is required to be submitted to the Montana DEQ Asbestos Control Program. An inspection of the rest area building has been conducted. Asbestos containing materials (ACM) has been identified in the joint compound of the gypsum wallboard system at 2% chrysotile. A copy of the asbestos inspection is available from the Department.

B. Construction Requirements: Prior to demolishing or renovating any portion of the rest area building:

1) Retain a qualified contractor holding a current and valid DEQ-accreditation for asbestos abatement work.

2) Remove any ACM, as necessary, under the direction of a DEQ-accredited contractor during demolition or renovation. Ensure the DEQ-accredited contractor obtains the necessary asbestos project permit from DEQ prior to any removal of ACM.

3) Retain a qualified consultant to provide final abatement inspection services and air clearance sampling.

C. Submittals: Submit a DEQ Demolition Notification form to the Montana DEQ Asbestos Control Program at least 10 working days in advance. The Montana Demolition Notification form MTACP02 is available through the program internet site at http://deq.mt.gov/Public/asbestos/Forms under the Permitting and Notifications Forms section.

D. Measurement and Payment. Asbestos work shall be incorporated into other building work items of the contract.

23. VEGETATED CONCRETE BLOCK MAT

A. Description. Vegetated Concrete Block Mat is manufactured from individual concrete blocks tied together with high strength knitted polypropylene bi-axial geogrid and a triple layer underlayment. Each block is tapered, beveled, and interlocked, and includes connections that prevent lateral displacement of the blocks within the mats when they are lifted for placement. Furnish and place the Vegetated Concrete Block Mat system in accordance with this specification and conforming with the lines, grades, design, and dimensions shown on the plans.

B. Materials. Use a tied Vegetated Concrete Block Mat with a Triple Layer Underlayment, consisting of Leno Weave, Recyclex TRM, and Curlex II Wood Excelsior. Provide Flexamat Plus or approved equal to meet the following specification requirements:

1) Concrete Blocks. Furnish blocks manufactured with concrete conforming to the cement requirements of ASTM C150 and to the aggregate requirements of ASTM C33. Meet a minimum compressive strength of 5,000 psi at 28 days. Furnish blocks that have a minimum weight of 3lb per block. Blocks to be placed no further than 2 inches apart.

2) Polypropylene Bi-Axial Geogrid. Provide revetment mat that is constructed of an interlocking geogrid comprised of an open knitted fabric composed of high tenacity, multifilament polypropylene yarns knitted and coated in tension with an acrylic based coating which is designed to resist degradation in environments with exposure to water and low pH (<4 pH) and high pH (>9 pH). When combined with the revetment mat, this will yield a high tenacity, low elongating, and continuous filament polypropylene geogrid that is embedded within the base of the concrete blocks. Ensure the geogrid meets the requirements of Table 1:

Table 1- Polypropylene Bi-Axial Geogrid.

Property	Units	Test	Requirement (1,2)
Mass/Unit Area	oz/yd^2	ASTM D5261	6.5
Aperture Size	in	Measured	1.4 x 1.4

Ultimate Wide Width Tensile Strength (MD x CMD)	lb/ft	ASTM D6637	2,055
Elongation at Ultimate Tensile Strength (MD x CMD)	%	ASTM D6637	6
Wide Width Tensile Strength @ 2% (MD x CMD)	lb/ft	ASTM D6637	822
Wide Width Tensile Strength @ 5% (MD x CMD)	lb/ft	ASTM D6637	1,640
Tensile Modulus @ 2% (MD x CMD)	lb/ft	ASTM D6637	41,100
Tensile Modulus @ 5% (MD x CMD)	lb/ft	ASTM D6637	32,800
UV Stabilization (Carbon Black by Weight)	%	BS 2782: Part 4 Method 452B	> 0.8

Notes:
[1]Minimum average roll values (MARV), except Aperture Size is nominal dimension.
[2]Minimum strength direction.

3) Underlayment Materials. The triple layer underlayment material will be packaged as part of the roll of concrete block mat. The underlayment material is two types of erosion control blanket (ECB) and a turf reinforcement mat (TRM).

a) The top layer of erosion control blanket is a five pick Leno Weave to provide strength and support to the lower underlayment matrix. Ensure the top layer of erosion control blanket meets the requirements of Table 2:

Table 2 – Top Layer of Underlayment (Erosion Control Blanket).

Property	Units	Requirement
GSM	g/m2	118
Density	Picks /10cm	62 x 24 (+/-2)
Wrap Strength	N / 5cm	≥ 350
Wrap Elongation	%	20 - 50
Wrap Shrinkage	%	≤ 7
Weft Strength	N / 5cm	≥ 280
Weft Elongation	%	20 - 50
Weft Shrinkage	%	≤ 9

b) The middle layer of turf reinforcement mat is a permanent non-degradable TRM consisting of 100% post-consumer recycled polyester with 80% five-inch or greater fiber lengths. It is of consistent thickness with fibers evenly distributed throughout the entire area of the TRM. The top and bottom of the TRM is covered with heavy duty polypropylene net. Fibers are tightly crimped and curled to allow fiber interlock, and to retain 95% memory of the original shape after loading by hydraulic events. Fibers have a specific gravity greater than 1.0. Ensure the middle layer of turf reinforcement mat meets the requirements of Table 3:

Table 3 – Middle Layer of Underlayment (Turf Reinforcement Mat).

Property	Units	Test Method	Requirement (1,2)
Thickness	in	ASTM D 6525	0.29
Light Penetration	%	ASTM D 6567	57
Resiliency	%	ASTM D 6524	86
Mass per Unit Area	lb/yd2	ASTM D 6566	0.5
MD-Tensile Strength Max.	lb/ft	ASTM D 6818	295

TD-Tensile Strength Max.	lb/ft	ASTM D 6818	194
MD-Elongation	%	ASTM D 6818	32
TD-Elongation	%	ASTM D 6818	41
Swell	%	ECTC Procedure	8
Water Absorption	%	ASTM D 1117 / ECTC	34
Specific Gravity	~	ASTM D 792	1.21
UV Stability	% min. @ 1000hrs	ASTM D 4355	80
Porosity	%	Calculated	97.5
Bench-Scale Rain Splash	@ 2 in/hr	ECTC Method 2	SLR = 5.9 (1,2)
Bench-Scale Rain Splash	@ 4 in/hr	ECTC Method 2	SLR = 5.0 (1,2)
Bench-Scale Rain Splash	@ 6 in/hr	ECTC Method 2	SLR = 6.3 (1,2)
Bench-Scale Shear	lb/ft2 @ ½ in of soil loss	ECTC Method 3	2.4 (2)
Germination Improvement	%	ECTC Method 4	430

Notes:
1 SLR is the Soil Loss Ratio, as reported by NTPEP/AASHTO.
2 Bench-scale index values should not be used for design purposes.

c) The bottom layer of erosion control blanket is a naturally seed free Great Lakes Aspen curled wood excelsior with 80% six-inch or greater fiber lengths. It is of consistent thickness with fibers evenly distributed throughout the entire area of the blanket. The top and bottom of each wood excelsior is covered with degradable polypropylene netting. Ensure the bottom layer of erosion control blanket meets the requirements of Table 4:

Table 4 – Bottom Layer of Underlayment (Erosion Control Blanket).

Property	Units	Test Method	Requirement (1,2,3)
Thickness	in	ASTM D 6525	0.42
Light Penetration	%	ASTM D 6567	35
Resiliency	%	ASTM D 6524	64
Mass per Unit Area	lb/yd2	ASTM D 6475	0.6 (1)
MD-Tensile Strength Max.	lb/ft	ASTM D 6818	127.0
TD-Tensile Strength Max.	lb/ft	ASTM D 6818	50.9
MD-Elongation	%	ASTM D 6818	29
TD-Elongation	%	ASTM D 6818	30
Swell	%	ECTC Procedure	89%
Water Absorption	%	ASTM D 1117 / ECTC	199
Bench-Scale Rain Splash	@ 2 in/hr	ECTC Method 2	SLR = 6.8(2,3)
Bench-Scale Rain Splash	@ 4 in/hr	ECTC Method 2	SLR = 7.2(2,3)
Bench-Scale Rain Splash	@ 6 in/hr	ECTC Method 2	SLR = 7.6 (2,3)

Bench-Scale Shear	lb/ft2 @ ½ in of soil loss	ECTC Method 3	2.6 (3)
Germination Improvement	%	ECTC Method 4	645

Notes:
1 Weight is based on a dry fiber weight at time of manufacturing. Baseline moisture content of Great Lakes Aspen excelsior is 22%.
2 SLR is the Soil Loss Ratio, as reported by NTPEP/AASHTO.
3 Bench-scale index values should not be used for design purposes.

C. Performance. Provide a Vegetated Concrete Block Mat that meets the requirements of Table 5:

Table 5 – Vegetated Concrete Block Mat Requirements.

Test	Tested Value	Bed Slope	Soil Classification	Limiting Value
ASTM 6460	Shear Stress	30%	Sandy Loam (USDA)	24 lb/ft2
ASTM 6460	Velocity	20%	Loam (USDA)	30 ft/sec

D. Equipment. Provide the proper equipment to place the mat that will not damage mat material or disturb the topsoil subgrade and seed bed.

E. Construction Requirements. Prior to installing Vegetated Concrete Block Mat, prepare the subgrade as detailed in the plans. All subgrade surfaces to be smooth and free of all rocks, stones, sticks, roots, and other protrusions or debris of any kind that would result in an individual block being raised more than 3/4in above the adjoining blocks. Provide a 4in thick topsoil layer for subgrade material that can sustain growth.

1) Ensure the prepared 4in thick topsoil subgrade provides a smooth, firm, and unyielding foundation for the mats. Grade the subgrade topsoil to conform with the lines, grades, and dimensions shown on the plans. Channels or ditches, grade shape to concentrate flow to middle of mat.

2) Distribute seed and fertilizer on the prepared topsoil subgrade before installation of the concrete mats in accordance with manufacturer specifications. Seed and fertilize according to the specifications in the revegetation special.

3) Install mats to the line and grade shown on the plans and per the manufacturer's guidelines. The manufacturer or authorized representative will provide technical assistance during the slope preparation and installation of the concrete block mats as needed.

4) At the upstream and downstream extent of the mat embed three blocks of the Vegetated Concrete Block mat into the subgrade to serve as an anchor trench.

5) Vertically embed two blocks of Vegetated Concrete Block mat at extents parallel to flow direction.

6) Provide fastening or anchoring as detailed in the plans. Provide "U" anchors that consist of #3 rebar.

F. Delivery and Storage. Cover the mat or otherwise protect it during long periods of storage to protect against degradation of the backing material as recommended by the manufacturer.

1) Inspect all mats upon delivery. Assure that all units are sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction.

2) Chipping or missing concrete resulting in a weight loss exceeding 15% of the average weight of a concrete unit is grounds for rejection. Replace, repair, or patch the damaged areas per the manufacturer's recommendations.

G. Method of Measurement. The Vegetated Concrete Block Mat will be measured by the square yard, as shown on the plans, complete in place. Anchor trenches and overlaps are not measured for payment.

H. Basis of Payment. Payment at the contract unit price for Vegetated Concrete Block Mat – Square Yard is full compensation for all costs needed to furnish and install the item of work, including topsoil, fertilizer, seed, “U” anchors, overlaps, anchor trenches, vertical embedment areas, and any other required resources.

24. VERIFICATION FOR MODIFYING EXISTING DRAINAGE STRUCTURES

A. Description. Field verify existing culvert and structure location, shape, diameter, and thickness prior to ordering new materials to facilitate field installation or modification.

B. Construction Requirements. Provide and install new materials as shown in the plans to fit the in-place culverts and structures that will be reused.

C. Method of Measurement. None.

D. Basis of Payment. Include in the cost of related bid items.

END OF SECTION I

APPENDIX-A – VOLUME-II TO FOLLOW

BAD ROUTE REST AREA REHAB

IM 94-6(67)193
UPN NUMBER 9877000

SITEWORK, ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING SPECIAL PROVISIONS (VOLUME 2)

VOLUME 2 OF 2

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SECTION 02 140
DEWATERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dewatering

1.2 SUBMITTALS

A. Conform with Section 01300 – Submittals

B. Submit a dewatering plan prior to construction showing the proposed method of keeping the construction area as dry as possible as determined by the ENGINEER.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

2.1 GENERAL

A. Design, install, test, operate, maintain and monitor dewatering facilities. Collect discharge water from dewatering systems and convey water to discharge points as approved by the ENGINEER.

B. Keep all excavations dry and free from water during construction and the placement of materials.

2.2 DEWATERING

A. Furnish all necessary labor, equipment, pumps and incidentals necessary to dewater the project site during construction.

B. Before excavating to final grade for structures, bring the water level to an acceptable level as determined by the ENGINEER. Maintain this water level until the structures are completed and backfill has been placed around the structures.

C. Control pumping operations so that the groundwater level rises and lowers slowly and uniformly.

D. Groundwater levels may fluctuate due to seasonal conditions.

2.3 PROTECTION

A. Provide sufficient protection at all times to ensure the safety of personnel, equipment, and materials, and the public for activities relating to dewatering and diversion.

2.4 PERMITS

A. CONTRACTOR is responsible for obtaining all permits related to dewatering and discharge of water from dewatering. Including but not limited to Authorization to Discharge under the Montana Pollutant Discharge Elimination System (MPDES).

2.5 DISCHARGE OF WATER

A. Do not allow water resulting from dewatering activities to be discharged or disposed of in such a manner as to damage project or adjacent property.

B. Discharge water in compliance with construction permits and all applicable laws and regulations.

2.6 EXISTING STRUCTURES

A. Conduct dewatering in a manner to avoid damage to existing structures.

B. CONTRACTOR is responsible for repairing all structures damaged as a result of the dewatering.

C. No additional payment will be made to CONTRACTOR for repairing any structures damaged by dewatering and/or diversion.

2.7 CLEANUP

A. Upon completion of project tasks requiring temporary dewatering specified herein, remove all such facilities, grade, and restore all disturbed areas to their original condition, and in accordance with these specifications.

B. No berms, excavations for dewatering, or similar features are allowed to remain at the completion of project.

C. All restoration is subject to approval by the Project Manager.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

A. Measurement and payment will be made as specified in special provisions of the Contract Documents.

END OF SECTION 02 140

SECTION 02 730
SANITARY SEWER COLLECTION SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

A. Furnish and install sewer pipe and fittings including manholes, service lines and other appurtenant structures as specified in the Contract and this section. Pipe strength classifications are shown on the plans, listed in the Contract Documents or specified herein.

1.2 CERTIFICATION BY MANUFACTURER

B. Furnish a manufacturer's certification for all pipe and fittings, certifying that the pipe and fittings meet the contract requirements.

1.3 REFERENCES

ASTM C76	Reinforced Concrete Pipe
ASTM D361	Low Head Pressure RCP
ASTM C443	O-ring Rubber Gaskets
ASTM C478	Precast Reinforced Concrete Manhole Sections
ASTM C655	D-Load RCP
ASTM D1784	Rigid Polyvinyl Chloride Compounds
ASTM D2241	PVC Pressure Pipe
ASTM D3034	Polyvinyl Chloride Sewer Pipe and Fittings
ASTM F679	Large Diameter PVC Pipe
ASTM F714	HDPE Pipe-Dimensions
ASTM 3350	High Density Polyethylene Pipe
ASTM F949	PVC Open Profile Pipe

1.4 STANDARD DRAWINGS:

A. Standard Drawings in Appendix A applicable to this section are as follows:

Standard Drawing No. 02660-2	Water and Sewer Main Separation
Standard Drawing No. 02720-3	Sanitary Sewer and Storm Drain Manhole
Standard Drawing No. 02720-4	Standard Straight Manhole
Standard Drawing No. 02720-5	48" (122 cm) Standard Manholes Showing Two Types of Cone Sections
Standard Drawing No. 02720-6	Pre-Cast Manhole Bases
Standard Drawing No. 02720-7	Typical Manhole Channel Details
Standard Drawing No. 02720-8	Standard Cast Iron Cover

Standard Drawing No. 02720-9	Standard 24” (61 cm) Cast Iron Ring Manhole Frame
Standard Drawing No. 02730-1	Nomograph for Air Testing Gravity Sewer Mains
Standard Drawing No. 02730-2	Sanitary Sewer Service Line
Standard Drawing No. 02730-3	Deep Sanitary Sewer Service Line

PART 2 PRODUCTS

2.1 GENERAL

A. Furnish sewer pipe and fittings as specified in the Contract Documents and meeting the materials and testing requirements of this Section. Furnish wye or tee branches and service line piping of the same material and design as the sewer pipe unless specified otherwise. Pipe strength classifications are shown on the plans and/or are listed in the Contract Documents.

B. References made to ASTM, ANSI or AASHTO designation are the latest revision at the time of call for bids.

C. Assure all pipe is clearly marked with type, class and/or thickness as applicable. Assure lettering is legible and permanent under normal conditions of handling and storage.

D. Furnish the joint type, class, thickness designation, castings, lining, marking, testing, etc. as specified.

2.2 PIPE MATERIALS

A. Polyvinyl Chloride (PVC) Pipe

1. General

a. Furnish PVC pipe produced by a continuous extrusion process, employing a prime grade of un-plasticized polyvinyl chloride. Assure the grade used is highly resistant to hydrogen sulfide, sulfuric acid, gasoline, oil, detergents and other chemicals found in sewage and industrial wastes. Assure the material meets “Rigid Polyvinyl Chloride Compounds” - ASTM Designation D-1784 requirements. Assure the pipe has self-extinguishing flammability characteristics.

2. Gravity Sewer Pipe

a. Furnish gravity sewer pipe meeting one of the following requirements:

1) ASTM D-3034, “Standard Specifications for Polyvinyl Chloride Sewer Pipe and Fittings”, with an SDR of 35 4"- 15" (10 cm - 38 cm).

2) ASTM F679, “Standard Specifications for PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings” 18"- 36"(46 cm - 76 cm).

3) ASTM F949, “Standard Specification for PVC Corrugated (Open Profile) Sewer Pipe with a Smooth Interior and Fittings” larger than 12” (10cm).

b. Furnish pipe having nominal 12.5 feet (3.8 meters), laying lengths, except shorter lengths may be used adjacent to manholes, lampholes or other appurtenances. Assure each pipe section is marked, as a minimum, with size, SDR, “Sewer Pipe” and Code Number.

3. Pressure Sewer Pipe

    a. Furnish pressure sewer pipe meeting ASTM D2241, "Standard Specification for Polyvinyl Chloride Plastic Pipe (SDR-PR), with an SDR of 26 and a pressure rating of 160.

    b. Use a nominal laying length of 20 feet (6.1 meters), except shorter lengths may be used adjacent to bends or other appurtenances. Assure each pipe length is marked, as a minimum, with size, SDR, pressure rating or both, ASTM designation and manufacturer's name and code.

4. Pipe Jointing

    a. Furnish each pipe length with a bell designed to provide a watertight joint when jointing the bell and spigot with a rubber ring.

    b. Make a rubber gasket joint for PVC pipe and fittings using a rubber gasket compressed between the outer surface of the spigot and the inner surface of the bell. Assure the joint is completely sealed by the gasket so that the assembly remains watertight under all service conditions, including expansion, contraction, settlement and pipe deformation. Follow the manufacturer's recommendations when assembling the rubber ring joint.

5. Fittings

    a. Assure wye or tee fittings for connecting service lines are of the same material, construction and joint design as the main sewer pipe.

B. Concrete Pipe

1. General

    a. Furnish concrete sewer pipe meeting ASTM Specifications C76 or C655, latest revision, except as noted herein. Assure cement used to make concrete pipe is Type II A Modified, Type V or other approved cement containing less than 5 percent Tricalcium Aluminate. The pipe strength classifications for C76 or C655 specification pipe is listed in the plans or Contract Documents.

    b. Furnish pipe meeting the referenced ASTM specifications on permissible variations in pipe dimensions. Assure the barrel thickness is uniform to providing a constant flow area without projections across joints.

2. Fittings

    a. Use wye or tee fittings for connecting service lines of the same material, construction and joint design as the main sewer pipe.

3. Jointing Material

    a. Make joints for concrete pipe using flexible, watertight, rubber- type gaskets meeting to ASTM C443, with an O-ring gasket confined in the pipe tongue groove.

4. Pipe Jointing

    a. Thoroughly clean the spigot and bell ends of the pipe before joint assembly. Follow the pipe and joint manufacturer's recommendations for pipe jointing. Check the position of the rubber gaskets and pipe assembly using a feeler gauge before backfilling

the trench. Visually inspect and gauge pipe and joints from inside the pipe where pipe size permits to assure proper gasket position and joint gap tolerances.

5. Material Testing

a. When the pipe supplier is not an American Concrete Pipe Association Certified plant, the pipe supplier shall furnish the Engineer with certified test results from an independent testing laboratory on the following: (a) crushing strength (3-edge bearing method), (b) absorption, and (c) hydrostatic test. Furnish test results for each pipe as specified in ASTM C76 or C655, or a minimum two percent of the number of pipe supplied, whichever is greater. Cost of these tests to be borne by the pipe supplier. The engineer retains the option to witness all testing completed at the production facility.

C. High Density Polyethylene (HDPE) Pipe

1. Pipe

a. Furnish non-profile wall HDPE pipe meeting ASTM D3350, having a cell classification of PE 34-5434C. Assure dimensions and workmanship meet ASTM F714 requirements.

2. Fittings

a. Use wye or tee fittings for connecting service lines of the same material construction and joint design as the main sewer pipe.

3. Pipe Jointing

a. Heat fusion weld all field joints to meet the manufacturer's recommendations.

D. Other Pipe Materials

1. Other pipe materials may be specified at the discretion of the Engineer and Owner.

2.3 MANHOLES

A. General

1. Construct manholes from precast concrete sections having frames, covers, and steps meeting Standard Drawings.

B. Precast Concrete Sections

1. Furnish manholes meeting ASTM C478; "Precast Reinforced Concrete Manhole Sections", specifically including mandatory rejection requirements.

C. Steps

1. Furnish non-corrosive steps, 12-inches (30 cm) in width, of 1/2-inch (13 mm) steel rod encased with polypropylene. Assure steps withstand 400 pound (180 kg) vertical loads and 1,000 pound (450 kg) pull-out resistance.

D. Frames and Covers

1. Furnish frames and covers meeting Standard Drawing Nos.02720-8 and 02720-9. Furnish 2-hole type covers unless specified otherwise.

E. Concrete Base

1. Furnish precast concrete bases or field poured on undisturbed earth. Use concrete meeting Section 03310: STRUCTURAL CONCRETE.

PART 3 EXECUTION

3.1 PIPE AND SERVICE LINE INSTALLATION

A. Excavation and Backfill

1. Perform pipeline excavation and backfill meeting the applicable requirements of Section 02221: TRENCH EXCAVATION AND BACKFILL FOR PIPELINES AND APPURTENANT STRUCTURES.

B. Responsibility for Materials

1. Be responsible for all material furnished. Replace all material found defective in manufacture or damaged in handling after delivery. This includes furnishing all material and labor required for the replacement of installed material discovered defective before final acceptance of the work or during the guarantee period.

2. Be responsible for the safe storage of material intended for the work until it has been incorporated in the completed project.

C. Handling of Pipe

1. Deliver and distribute all pipe to the site. Load and unload pipe, fittings and accessories by lifting with hoists or skidding to avoid shock or damage. Do not drop any materials. Do not roll or skid pipe handled on skidways against pipe already on the ground.

2. In distributing the material at the site of the work, unload each piece opposite or near the place where it is to be laid in the trench. Keep the interior of all pipe and other accessories free from dirt and foreign matter at all times.

3. Handle pipe to prevent damaging coating or lining. If any part of the coating or lining is damaged, make all repairs in a manner satisfactory to the Engineer.

D. Laying Pipe

1. Lay and maintain all pipe to the specified lines and grades with fittings, tees and manholes at the required locations. Establish line and grade using batter boards and string line, laser equipment or other approved methods. When batter boards and string line are used, use a minimum of three batterboards at all times.

2. Install wye or tee fittings in the mainline sewer for service line connections. Furnish wye or tee fittings of the same material, design and specifications as the sewer main pipe. Joint service pipe to tee branches or main line pipe other than PVC using special joint adapters manufactured specifically for jointing the two types of pipe.

3. Use tools and equipment, satisfactory to the Engineer, for the safe and convenient prosecution of the work. Carefully lower all pipe and fittings into the trench to prevent damage to pipe materials and protective coatings and linings. Do not drop or dump any materials into the trench.

4. Take every precaution to prevent foreign material from entering the pipe while it is being installed. At times when pipe laying is not in progress, close the open ends of pipe using a plug or other means approved by the Engineer. Clean and remove all sand, gravel, concrete and cement grout that has entered the lines during construction.

E. Tolerances

1. Install the pipe within 1/2-inch (13 mm) of the specified alignment and within 1/4-inch (6 mm) of the specified grade.

3.2 MANHOLES

A. Construction

1. Construct manholes to the specified dimensions. Make invert channels smooth and semi-circular in shape conforming to the inside of the adjacent sewer section. Make changes in flow direction with a smooth curve of as large a radius as the manhole size will permit. Make changes in channel grade and size gradually and evenly. The invert channels may be formed directly in the manhole base concrete or by laying half-pipe in the concrete. Make the floor of the manhole outside the channel smooth and slope toward the channel at one inch per foot (8 cm per meter).

2. Joint all connections between manhole walls and base and between wall sections adjusting rings and frame making the manhole watertight. For all horizontal joints located below the established high groundwater elevation, install a preformed rubber gasket joint. The established high groundwater level is shown on the plans or noted in the Special Provisions. For all sewer pipe to manhole joints, use gasketed, flexible, watertight connections that will accommodate differential settlement. Acceptable options for these connections to the manhole are as follows:

   a. Adjacent Joints: Bell and spigot pipe joints with rubber sealing rings located within 12 inches (30 cm) of the manhole wall.

   b. Compression-Type Flexible Connector: A resilient, flexible connection, cast into manhole wall, providing 10 degrees deflection.

   c. Boot-Type Flexible Connector: A flexible, watertight connection consisting of a rubber gasket or boot, metal expansion ring and a metal take-up clamp. Assure the expansion ring holds the gasket in the manhole wall, with the take-up clamp holding the gasket to the pipe.

   d. Options (b) and (c) are limited to precast manhole base inverts and other installations where the flexibility of the connection is not compromised.

   e. Construct manholes meeting ASTM C478, and the rejection criteria stated therein.

   f. Keep manhole construction within one manhole distant behind sewer pipeline construction.

3. Install adjusting rings on each manhole to bring the manhole top elevation to match the existing or specified ground elevations. Use manhole rings with a 2-inch minimum (5 cm) and 12-inch (30 cm) maximum height. Furnish adjusting rings reinforced with the same percentage of steel as the riser and top.

3.3 SANITARY SEWER SERVICE LINES

A. Construct service lines meeting Standard Drawing 02730-2. Install the service line to the property line. Plug the end of the service line with a stopper and gasket, using a gasket of the same type used for pipe jointing. Do not grout the plugs.

B. Mark the sanitary sewer and storm drain service line ends at the property line using steel fence post 5 feet (1.5 m) long, buried at least 2 feet (0.6 m). Place a 2" X 2" (5cm X 5 cm) wood marker extending from the pipe invert to ground line. Wire the 2" X 2" (5cm X 5 cm) marker to the steel fence post. Where applicable, mark the concrete curb to identify the service locations. Paint sanitary sewer service markers green and storm drain service markers gray.

3.4 TESTS

A. Make all tests after backfill is completed, but before any surface restoration or street surfacing. Be responsible for finding and repairing all breaks and leaks revealed by the tests. Additionally, perform all tests in the presence of the Engineer, resident inspector, or the Owner's other designated representative.

B. Light Test (Visual)

1. After the trench has been backfilled and compacted as specified in Section 02221, perform a light test between manholes to check alignment and grade for pipe displacement. Excluding curved alignments shown on the plans, the completed pipeline is to permit a true circle of light to be visible from one manhole to the next. If alignment or grade is not that specified and displacement of pipe is found, remedy all defects.

C. Leakage Test

1. New sewer line will not be finally accepted until leakage tests are made assuring the Engineer that pipe laying and jointing are satisfactory.

D. Water Test

1. Where groundwater is at least 2 feet (0.6 m) above the sewer line, make tests by sealing off the section of lines between manholes and measuring the actual flow by collecting or pumping the discharge into barrels or other approved methods. Continue tests at a minimum of 4 hours for each section tested. Allow time to soak lines and manholes in advance of performing tests.

2. When groundwater is not 2 feet (0.6 m) above the pipe, test as follows: On flat slopes where the depth over the centerline of the pipe in the lower manhole of the section being tested will be not more than 10 feet (3 m), fill the upper manhole to 2 feet (0.6 m) over the top of the pipe or 2 feet (0.6 m) above the groundwater elevation (whichever is higher), and block the lower manhole. When the above conditions cannot be met, the Engineer may order testing the line in sections between manholes. Measure the leakage by checking the water level drop in the manhole over a 4-hour period.

3. The allowable infiltration or exfiltration, including manholes, cannot exceed 200 gallons per day per mile of sewer per inch of pipe diameter (185 liters per day per kilometer of sewer per centimeter of pipe diameter). This does not exclude obvious and concentrated leaks and physical defects, such as open joints, pinched gaskets, cracked barrels or bells, etc. Make repairs on concentrated leaks, and as required to reduce infiltration or exfiltration leakage below the specified rate.

E. Air Test (Alternative)

1. As an alternate method to water testing, the Contractor may utilize low pressure air to test the sewer mains. Use the test procedure described below: Plug both ends of the pipe under test with airtight plugs and brace to prevent slippage and blowout. Furnish one plug with an inlet tap or other provision for connecting an air hose.

2. Equip the air supply hose, connected between the air compressor and the plug, with a throttling valve, an air bleed valve and a high-pressure shutoff valve for control. Equip the low-pressure side of the throttling valve with a tee for a monitoring pressure gauge, protected by a gauge cock. This cock is kept closed except when the pressure loss is being timed.

3. If the pipeline is submerged under groundwater, the back pressure, caused by the water head, is measured and added to the standard test pressures to compensate for the groundwater effect on the air test.

4. Apply air slowly to the pipeline until the pressure reaches 4.0 psig (27.6 j). Throttle the air supply to maintain the internal pressure between 4.0 and 3.5 psig (27.6 -24.1 j) for at least 2 minutes. During this time check the plugs with soap solution to detect any plug leakage.

5. When the pressure reaches exactly 3.5 psig (24.1 j), disconnect the air supply, start a stop watch and record the time for the pressure to drop to 2.5 psig (17.2 j). The minimum time allowed for the pressure drop is computed on an air loss rate of 3.5 cfm (5.9m 3 /min) or an air loss rate of 0.0030 cubic feet per minute (cfm) per square foot (0.055 m 3 /min per square meter) of inner pipe surface area under test, whichever rate yields the least time for the pressure drop. Should the time of the pressure drop between 3.5 and 2.5 psig (24.1 - 17.2 j) be less than the allowable specified time, make the necessary leakage repairs and repeat the air test.

6. Standard Drawing 02730-1 provides a nomograph which may be used to compute testing times for air testing. The nomograph computes results based upon English (U.S. Customary) units.

7. For single pipe size test sections, the length limits for minimum test times obtained from Standard Drawing No.02730-1 entitled "Nomograph for Air Testing Gravity Sewer Mains" are contained in the following table.

TABLE 3.1

LENGTH LIMIT FOR MINIMUM TEST TIMES

Pipe Diameter, Inches (cm)	Test Section Length, Foot (m)	
	Minimum	Maximum
4 (10)	642(196)	1124 (343)
6 (15)	429(131)	751 (229)
8 (20)	322(98)	564 (172)
10 (25)	257(78)	450 (137)
12 (30)	215(66)	376 (115)
15 (38)	172(52)	300 (91)
18 (46)	43(44)	1250 (76)
21 (53)	123(37)	215 (66)
24 (61)	107(33)	188 (57)

8. For test sections that are shorter than the minimum lengths, new test times must be calculated. This is done by multiplying the test time from the nomograph by the actual length of the test section (in feet) and then dividing the resultant product by the minimum test section length from the preceding table.

9. For test sections exceeding the maximum lengths, either shorten the test section to an allowable length or use the water test.

F. Number of Tests

1. Perform the number of leakage tests directed by the Engineer to assure that materials and workmanship are acceptable. Repair defective joints using only approved methods. Replace pipe having cracked or broken barrels. Do not exceed 800 feet (240 m) of sewer line per test unless otherwise approved.

G. T.V. Inspection

1. All sewer mains shall be inspected using a television camera before final acceptance. A sewer line is deficient and unacceptable if (1) the alignment is outside the specified limits, (2) water ponds in any section are equal to or greater than 2 times the grade tolerance specified herein under Section 02730.3.E.1, or (3) the pipe has visible defects such as open joints, pinched gaskets, cracked barrels or bell, or similar defects.
2. Pay all costs incurred in any television inspection performed solely for Contractor benefit.
3. Record all television inspections in a format acceptable to the Owner. Pull the camera through the sewer at 30 feet per minute (9 meters per minute maximum). If the camera is pulled by attaching to the hose of a hydraulic sewer cleaner, assure the hose is not active during the pulling process.

H. Deflection Testing

1. The Engineer may require deflection testing of all or any portion of a flexible pipe installation to assure the construction quality. Flexible pipe is pipe that will deflect at least 2 percent without any sign of structural distress.
2. Conduct deflection tests, when performed on PVC pipe, meeting ASTM D3034 and satisfy either of the following deflection limitations:

TABLE 3.2
DEFLECTION TESTING LIMITATIONS

Minimum Period Between Trench Backfilling & Testing	Minimum Mandrel Diameter as a Percent of Inside Pipe Diameter
7 Days	95.0
30 Days	92.5

3. Mandrels must have at least nine arms. Perform the mandrel test without mechanical pulling devices.

I. Material and Equipment for Testing

1. Furnish all labor, equipment and materials (including water) necessary for performing the sewer line tests at Contractor expense.

3.5 WATER AND SEWER MAIN SEPARATION

A. Horizontal and vertical separation between water and sewer mains is dictated by Montana Department of Environmental Quality.

PART 4 MEASUREMENT AND PAYMENT

4.1 GENERAL

A. The following items are the pay items for the work covered under this section. Payment for these items is full compensation for providing all materials, tools, labor and equipment necessary to complete the item and all incidental work related thereto, whether specifically mentioned herein or not.

4.2 SEWER MAINS

A. Measurement of sewer mains are made in lineal feet (meters) of the various sizes and classes along the centerline of pipe from center to center of manholes. Payment for sewer main is made at the contract unit price bid per lineal foot (meters) of the various sizes and classes called for, which includes furnishing and installing pipe, trench excavation and backfill, furnishing and

placing Type 1 pipe bedding, specials required for connection to manholes, testing and all other work necessary or incidental for completion of the item.

4.3 MANHOLES

A. Measurement of each manhole for payment is made in two parts: (1) for a basic manhole, and (2) for any additional vertical height over and above the basic depth. A basic manhole is defined as being 5 feet deep (1.5 m) from the lowest invert to the top of the manhole frame and cover. Any manhole less than 5 feet deep (1.5 m) is considered as one basic manhole.

B. Any manhole over 5 feet deep (1.5 m) is considered as one basic manhole plus a vertical height measurement to the nearest 0.1 foot (0.03 m). Basic manholes are measured by numerical count and the additional vertical heights feet (meters) of manhole. The measurement of the additional vertical height of manhole is the vertical height of the manhole from the lowest invert to the top of the cast iron frame minus 5 feet (1.5 m).

C. Payment for furnishing and installing a basic manhole, complete in-place, is made at the contract unit price bid per each for “Basic Manholes”, 5.0 feet deep. Such payment includes base, manhole sections, steps, cast iron ring and cover, joint sealer and all other incidentals required to complete the item.

D. Payment for furnishing and installing manholes deeper than the basic manhole depth is made at the contract unit price bid per vertical foot (meter) for “Additional Manhole Depth” and includes manhole sections, steps, joint sealer and all other incidentals to complete the item.

E. Payment is made under:

1. Basic Manhole, 5'-0" (1.5 meter) Depth - Per Each.

2. Additional Manhole Depth - Per Vertical Foot (meter).

4.4 SANITARY SEWER SERVICE LINES

A. Measurement is made along the pipe from the tee or wye of the main sewer through tees, wyes and other fittings to the street margin or right-of-way margin. Measurement is to the nearest foot (0.3m).

1. Payment for services is based on the following bid items as specified in the contract:

a. Trench excavation and backfill is included in the linear foot price bid for sewer service pipe.

b. (size) (class) Sewer Service Pipe in Place,” per linear foot.

4.5 GENERAL

A. The contract bid prices are full payment for all labor, materials, tools and other incidentals as maybe required to complete the items of work in the Contract.

END OF SECTION 02 730

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SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Repointing mortar joints.

B. Repair of damaged masonry.

PART 3 EXECUTION

2.1 REBUILDING

A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.

B. Support structure as necessary in advance of cutting out units.

C. Mortar Mix: Colored and proportioned to match existing work.

D. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

2.2 REPOINTING

A. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch (6 mm) depth or until sound mortar is reached.

B. Do not damage masonry units.

C. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch (6 mm) layers. Form a smooth, compact concave joint to match existing.

2.3 CLEANING

A. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

END OF SECTION 04 0100

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural dimension lumber framing.
B. Nonstructural dimension lumber framing.
C. Rough opening framing for doors, windows, and roof openings.
D. Sheathing.
E. Preservative treated wood materials.
F. Miscellaneous framing and sheathing.
G. Communications and electrical room mounting boards.
H. Concealed wood blocking, nailers, and supports.
I. Miscellaneous wood nailers, furring, and grounds.

1.2 RELATED REQUIREMENTS

A. Section 06 1323 - Heavy Timber Framing.
B. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

1.3 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
B. AWPA U1 - Use Category System: User Specification for Treated Wood 2022.
C. PS 1 - Structural Plywood 2019.
D. PS 20 - American Softwood Lumber Standard 2021.
E. WWPA G-5 - Western Lumber Grading Rules 2021.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Provide technical data on wood preservative materials and application instructions.
C. Samples: For rough carpentry members that will be exposed to view, submit two samples, [____]by____ inch ([____]by____ mm) in size illustrating wood grain, color, and general appearance.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
B. Correct defective Work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Douglas Fir-Larch, unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.

3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Provide sustainably harvested wood; see Section 01 6000 - Product Requirements for requirements.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.
B. Sizes: Nominal sizes as indicated on drawings, S4S.
C. Moisture Content: S-dry or MC19.
D. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
   1. Species: Douglas Fir-Larch.
   2. Grade: No. 1.
E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16 (50 by 150 mm through 100 by 400 mm)):
   1. Species: Douglas Fir-Larch.
   2. Grade: No. 1 and Better.
F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.3 EXPOSED DIMENSION LUMBER

A. Sizes: Nominal sizes as indicated on drawings.
B. Surfacing: S4S.
C. Moisture Content: S-dry or MC19.

2.4 EXPOSED TIMBERS

A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
B. Moisture Content: Kiln-dry (20 percent maximum).
C. Surfacing: S4S.
D. Species: Redwood.
E. Grade: Clear Heart Structural.

2.5 CONSTRUCTION PANELS

A. Other Applications:
   1. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
   2. Other Locations: PS 1, C-D Plugged or better.

2.6 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
B. Sill Gasket on Top of Foundation Wall: 1/4 inch (6 mm) thick, plate width, closed cell plastic foam from continuous rolls.
C. Water-Resistive Barrier: See Section 07 2500.

2.7 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.

a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

b. Treat lumber exposed to weather.

c. Treat lumber in contact with roofing, flashing, or waterproofing.

d. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.1 PREPARATION

A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

B. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.4 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
D. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Wall-mounted door stops.
   6. Chalkboards and marker boards.
   7. Wall paneling and trim.
   8. Joints of rigid wall coverings that occur between studs.

3.5 ROOF-RELATED CARPENTRY
A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.6 INSTALLATION OF CONSTRUCTION PANELS
A. Roof Sheathing: Secure with long dimension perpendicular to trusses, with ends over firm bearing and staggered, using nails, screws or staples.

3.7 TOLERANCES
A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.8 CLEANING
A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.
B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 1000

SECTION 06 1323
HEAVY TIMBER FRAMING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber 2019.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.1 WOOD MATERIALS

A. Wood fabricated from old growth timber is not permitted.

B. Lumber Grading Rules: RIS (GR).

C. Lumber: Stress group [____]; [_____] species; [____] grade; maximum moisture content of [____] percent.

PART 3 EXECUTION

3.1 ERECTION

A. Set structural members level and plumb, in correct position.

B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Do not field cut or alter structural members without approval of Architect.

END OF SECTION 06 1323

SECTION 06 1800
GLUED-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

1.2 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.3 QUALITY ASSURANCE

PART 2 PRODUCTS

2.1 GLUED-LAMINATED UNITS

A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Industrial grade.

1. Verify dimensions and site conditions prior to fabrication.
2. Cut and fit members accurately to length to achieve tight joint fit.
3. Fabricate member with camber built in.
4. Do not splice or join members in locations other than those indicated without permission.
5. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

2.2 MATERIALS

A. Steel Connections and Brackets: ASTM A36/A36M weldable quality, galvanize per ASTM A123/A123M.

B. Steel Connections and Brackets: ASTM A666, Type 304 stainless steel.

C. Bearing Plate Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

PART 3 EXECUTION

3.1 ERECTION

A. Lift members using protective straps to prevent visible damage.

B. Set structural members level and plumb, in correct positions or sloped where indicated.

END OF SECTION 06 1800

SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.1 SECTION INCLUDES

1.2 DEFINITIONS

A. Weather Barriers: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Water-Resistive Barrier: A material behind an exterior wall covering that is intended to resist liquid water that has penetrated behind the exterior covering from further intruding into the exterior wall assembly.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.4 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.1 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

2.2 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

A. Vapor Retarder Sheet: ASTM D4397 polyethylene film, clear.

1. Thickness: 10 mil, 0.010 inch (0.254 mm).
2. Water Vapor Permeance: As required by referenced standard for thickness specified.
3. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material.

2.3 ACCESSORIES

A. Sealants, Tapes, and Accessories Used for Sealing Water-Resistive Barrier and Adjacent Substrates: As indicated or complying with water-resistive barrier manufacturer's installation instructions.

B. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.

1. Width: 4 inches (102 mm).

C. Thinners and Cleaners: As recommended by water-resistive barrier manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.2 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.3 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Water-Resistive Barriers: Install continuous water-resistive barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Openings and Penetrations in Exterior Water-Resistive Barriers:

1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches (127 mm) onto water-resistive barrier and at least 6 inches (152 mm) up jambs; mechanically fasten stretched edges.
2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches (50 mm) beyond face of jambs; seal water-resistive barrier to flashing.
5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.

B. Owner’s Inspection and Testing: Cooperate with Owner’s testing agency.

1. Allow access to work areas and staging.
2. Notify Owner’s testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
3. Do not cover work of this section until testing and inspection is accepted.

C. Obtain approval of installation procedures from water-resistive barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

D. Take digital photographs of each portion of installation prior to covering up weather barriers.

3.5 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION 07 2500

SECTION 07 4113
METAL ROOF PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal roof panel system of preformed steel panels.

1.2 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

C. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing 2017.

D. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection 2021.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.

F. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings 2020a.

G. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference 2005 (Reapproved 2017).

H. ICC-ES AC188 - Acceptance Criteria for Roof Underlayments 2012, with Editorial Revision (2015).

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.

1. Show work to be field-fabricated or field-assembled.

C. Selection Samples: For each roofing system specified, submit color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches (305 mm) square, representing actual roofing metal, thickness, profile, color, and texture.

E. Test Reports: Indicate compliance of metal roofing system to specified requirements.

F. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.4 QUALITY ASSURANCE

1.5 DELIVERY, STORAGE, AND HANDLING

A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.

B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

1.6 FIELD CONDITIONS

A. Do not install metal roof panels, eave protection membrane, underlayment, or [_____] when surface, ambient air, or wind chill temperatures are below 45 degrees F (7 degrees C).

1.7 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty for weathertightness of roofing system, including agreement to repair or replace metal roof panels that fail to keep out water commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Metal Roof Panels: Provide complete roofing assemblies, including roof panels, clips, fasteners, connectors, and miscellaneous accessories, tested for compliance with the following minimum standards:

1. Structural Design Criteria: Provide panel assemblies designed to safely support design loads at support spacing indicated, with deflection not to exceed L/180 of span length(L) when tested in accordance with ASTM E1592.
2. Overall: Complete weathertight system tested and approved in accordance with ASTM E1592.
3. Thermal Movement: Design system to accommodate without deformation anticipated thermal movement over ambient temperature range of 100 degrees F (56 degrees C).

2.2 METAL ROOF PANELS

A. Metal Roof Panels: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with factory-applied finish.

1. Steel Panels:
   a. Zinc-coated steel complying with ASTM A653/A653M; minimum G60 (Z180) galvanizing.
   b. Steel Thickness: Minimum 24 gauge, 0.024 inch (0.61 mm).
2. Profile: Standing seam, with minimum 1.0 inch (25 mm) seam height; concealed fastener system for field seaming with special tool. Match existing.
3. Texture: Smooth.
4. Length: Full length of roof slope, without lapped horizontal joints.
5. Width: Maximum panel coverage of 16 inches (406 mm).

C. Metal Soffit Panels:

1. Profile: Style as indicated, with venting provided.
2. Material: Precoated steel sheet, 22 gauge, 0.0299 inch (0.76 mm) minimum thickness.

3. Color: As selected by Architect from manufacturer's standard line.

2.3 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

2.4 FABRICATION

A. Panels: Provide factory or field fabricated panels with applied finish and accessory items, using manufacturer's standard processes as required to achieve specified appearance and performance requirements.

B. Joints: Provide captive gaskets, sealants, or separator strips at panel joints to ensure weathertight seals, eliminate metal-to-metal contact, and minimize noise from panel movements.

2.5 FINISHES

A. Fluoropolymer Coil Coating System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch (0.023 mm); color and gloss as selected by Architect from manufacturer’s standard line.

2.6 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish or combination steel and closed-cell foam.

C. Sealants:

1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.

1. Type: Woven polypropylene with anti-slip polyolefin coating on both sides.
2. Minimum Requirements: Comply with ICC-ES AC188 for non-self-adhesive sheet.
3. Self Sealability: Nail sealability in accordance with ASTM D1970/D1970M.
4. Flammability: Minimum of Class A, in accordance with ASTM E108 test method.
5. Low Temperature Flexibility: Comply with ASTM D1970/D1970M.
6. Water Vapor Permeance: 1 perm (57.2 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M, Desiccant Method A.
7. Performance: Comply with ASTM D226/D226M, Type II asphalt-saturated organic felt.

8. Fasteners: As specified by manufacturer and building code qualification report or approval.

E. Underlayment: Self-adhering polymer modified asphalt sheet complying with ASTM D1970/D1970M, with strippable release film and top surface of woven polypropylene sheet.
   1. Minimum Requirements: Comply with requirements of ICC-ES AC188 for non-self-adhesive sheet.
   2. Sheet Thickness: 22 mil, 0.022 inch (0.55 mm) minimum total thickness.
   3. Low Temperature Flexibility: Comply with ASTM D1970/D1970M.
   4. Water Vapor Permeance: 0.1 perm (5.72 ng/Pa s sq m), maximum, when tested in accordance with ASTM E96/E96M using Desiccant Method (Method A).
   5. Products:
      a. Certainteed Roofing; WinterGuard HT - High Temperature Waterproofing Underlayment: www.certainteed.com/#sle.
      b. Henry Company; Blueskin RF200: www.henry.com/#sle.
      c. Polyglass USA, Inc; Polystick MTS Self-Adhered High Temperature Roof Underlayment: www.polyglass.us/#sle.
      d. System Components Corporation, Inc; FelTex SA300: www.systemcomponents.net/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to ensure that completed roof will be free of leaks.

C. Remove protective film from surface of roof panels immediately prior to installation; strip film carefully to avoid damage to prefinished surfaces.

D. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by metal roof panel manufacturer.

E. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

F. At locations where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.3 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and metal roof panel manufacturer's instructions and recommendations, as applicable to specific project conditions; securely anchor components of roofing system in place allowing for thermal and structural movement.

1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
2. Minimize field cutting of panels. Where field cutting is required, use methods that will not distort panel profiles. Use of torches for field cutting is prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Install roofing felt and building paper slip sheet on roof sheathing before installing preformed metal roof panels; secure by methods acceptable to roof panel manufacturer, minimizing use of metal fasteners; apply from eaves to ridge in shingle fashion, overlapping horizontal joints at least 2 inches (50 mm) and side and end laps at least 3 inches (75 mm); offset seams in building paper and seams in roofing felt.

D. Roof Panels: Install metal roof panels in accordance with manufacturer's installation instructions, minimizing transverse joints except at junction with penetrations.
1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by panel manufacturer.
2. Install sealant or sealant tape at end laps and side joints as recommended by metal roof panel manufacturer.

3.4 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.5 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION 07 4113

SECTION 07 4213
METAL WALL PANELS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured metal panels for walls, with related flashings and accessory components.

1.2 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.
B. Section 07 2500 - Weather Barriers: Weather barrier under wall panels.
C. Section 07 2700 - Air Barriers: Air barrier under wall panels.
D. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.

1.3 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.
B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document) 2015.
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data - Wall System: Manufacturer's data sheets on each product to be used, including:
    1. Physical characteristics of components shown on shop drawings.
    2. Storage and handling requirements and recommendations.
    3. Installation instructions and recommendations.
C. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
D. Samples: Submit two samples of wall panel, 12 inch (304.8 mm) by 36 inch (914 mm) in size illustrating finish color, sheen, and texture.
E. Manufacturer's qualification statement.
F. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
C. Prevent contact with materials that may cause discoloration or staining of products.

1.7 FIELD CONDITIONS

A. Do not install wall panels when air temperature or relative humidity are outside manufacturer's limits.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

C. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

2.2 METAL WALL PANEL SYSTEM

A. Wall Panel System: Factory fabricated prefinished metal panel system, site assembled.

1. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
2. Design Pressure: In accordance with applicable codes.
3. Maximum Allowable Deflection of Panel: L/180 for length(L) of span.
4. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
5. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
6. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
7. Corners: Factory-fabricated in one continuous piece with minimum 2-inch (51 mm) returns.
8. Provide continuity of weather barrier seal at building enclosure elements in accordance with requirements; see Section 07 2500.
9. Provide continuity of air barrier seal at building enclosure elements in accordance with requirements; see Section 07 2700.

B. Exterior Wall Panels:

1. Profile: Vertical; style as indicated.
2. Material: Precoated steel sheet, 26 gage, [___] inch ([___] mm) minimum thickness.
3. Panel Width: 16 inches (406.4 mm).
4. Color: To match existing.

C. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.

D. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

E. Anchors: Galvanized steel.

2.3 MATERIALS

A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.4 FINISHES

A. Fluoropolymer Coil Coating System: Manufacturer's standard multi-coat metal coil coating system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of coil coated metal surfaces having minimum total dry film thickness (DFT) of 0.9 mil, 0.0009 inch (0.023 mm); color and gloss to match sample.

2.5 ACCESSORIES

A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.

B. Concealed Sealants: Non-curing butyl sealant or tape sealant, see Section 07 9200

C. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.

D. Fasteners: Manufacturer's standard type to suit application; steel, hot dip galvanized.

1. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws.

E. Field Touch-up Paint: As recommended by panel manufacturer.

F. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that building framing members are ready to receive panels.

B. Verify weather barrier, see Section 07 2500, has been installed over wall panel substrate; see Section 05 4000.

3.2 PREPARATION

A. Protect surrounding areas and adjacent surfaces from damage during execution of this work.

3.3 INSTALLATION

A. Install panels on gable trusses in accordance with manufacturer's instructions.

B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.

C. Fasten panels to structural supports; aligned, level, and plumb.

D. Locate joints over supports.

E. Lap panel ends 2 inches (51 mm), minimum.

F. Provide expansion and control joints where indicated.

G. Use concealed fasteners unless otherwise indicated by Architect.

H. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.4 TOLERANCES

A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch (1.6 mm), maximum.

B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch (6.4 mm), maximum.

3.5 CLEANING

A. Remove site cuttings from finish surfaces.

B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

C. Upon completion of installation, thoroughly clean prefinished aluminum surfaces in accordance with AAMA 609 & 610.

3.6 PROTECTION

A. Protect metal wall panels until completion of project.

B. Touch-up, repair, or replace damaged wall panels or accessories before Date of Substantial Completion.

END OF SECTION 07 4213

SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, sheet metal roofing, [_____], and other items indicated in Schedule.

B. Sealants for joints within sheet metal fabrications.

C. Reglets and accessories.

D. Precast concrete splash pads.

1.2 RELATED REQUIREMENTS

A. Section 07 7123 - Manufactured Gutters and Downspouts.

1.3 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

E. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).

F. CDA A4050 - Copper in Architecture - Handbook current edition.

G. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch (0.61 mm) thick base metal, shop pre-coated with

PVDF coating.

1. Silicone Modified Polyester Coating: Pigmented organic powder coating, AAMA 2603; baked enamel finish system.
2. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
3. Color: As selected by Architect from manufacturer's standard colors.

2.2 ACCESSORIES

A. Fasteners: Galvanized steel , with soft neoprene washers.
B. Slip Sheet: 45 mil thickness EPDM under equipment pads.
C. Primer: Zinc chromate type.
D. Protective Backing Paint: Zinc molybdate alkyd.
E. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.
F. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.
G. Plastic Cement: ASTM D4586, Type I.
H. Reglets: Recessed type, galvanized steel; face and ends covered with plastic tape.

2.3 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
B. Form pieces in longest possible lengths.
C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
E. Fabricate corners from one piece with minimum 18-inch (450 mm) long legs; seam for rigidity, seal with sealant.
F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing plane. Return and brake edges.

2.4 **COLLECTOR HEAD AND DOWNSPOUT FABRICATION**

A. Gutters: SMACNA (ASMM), Rectangular profile.
B. Downspouts: Profile as indicated.
C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).
D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.
E. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3,000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.
F. Seal metal joints.

2.5 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.
B. Primer Type: Zinc chromate.
C. Protective Backing Paint: Zinc molybdate alkyd.

D. Concealed Sealants: Non-curing butyl sealant.
E. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
F. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION
A. Install starter and edge strips, and cleats before starting installation.
B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.38 mm).

3.3 INSTALLATION
A. Insert flashings into reglets to form tight fit. Secure in place with lead wedges. Seal flashings into reglets with sealant.
B. Secure flashings in place using concealed fasteners.
C. Apply plastic cement compound between metal flashings and felt flashings.
D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
E. Seal metal joints watertight.
F. Secure gutters and downspouts in place with concealed fasteners.
G. Secure collector heads and downspouts in place using concealed fasteners.

3.4 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements for field inspection requirements.
B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION 07 6200

SECTION 07 7100
ROOF SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured roof specialties, including copings, fascias, and vents.

B. Roof control and expansion joint covers.

1.2 RELATED REQUIREMENTS

A. Section 07 7200 - Roof Accessories: Manufactured curbs, roof hatches, and snow guards.

1.3 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2022.

B. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems 2017.

C. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007 (Reapproved 2018).

D. NRCA (RM) - The NRCA Roofing Manual 2023.

E. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.

C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.

D. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) details.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Control and Expansion Joint Covers:

1. GAF: www.gaf.com.
2. Johns Manville: www.jm.com.
3. MM Systems Corp: www.mmsystemscorp.com.

B. Pipe and Penetration Flashings:

2.2 COMPONENTS

A. Roof Edge Flashings: Factory fabricated to sizes required; corners mitered; concealed fasteners.

1. Configuration: Fascia, cant, and edge securement for roof membrane.
2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test methods RE-1 and RE-2 to positive and negative design wind pressure as defined by applicable local building code.

3. Material: Formed steel sheet, galvanized, 24 gauge, 0.024 inch (0.6 mm) thick, minimum.
4. Finish: 70 percent polyvinylidene fluoride.
5. Color: To match existing.

B. Pipe and Penetration Flashing: Base of rounded aluminum, compatible with sheet metal roof systems, and capable of accomodating pipes sized between 3/8 inch (9.5 mm) and 12 inches (305 mm).
1. Caps: EPDM.
2. Color: White.

C. Pipe Penetration Wall Seal: Seal for HVAC piping wall penetrations with wall-mounted rigid plastic outlet cover and elastomeric wall seal gasket.
1. Wall Outlet Size, Stucco and Masonry Applications: 7-1/2 inches wide by 10 inches high (190.5 mm wide by 254 mm high).
a. Elastomeric Sleeve Diameter: 1-11/16 inches (43 mm).
2. Outlet Cover Color: To be selected by Architect from manufacturer's standard line of colors.

D. Pipe Penetration Wall Seal and Insulated Piping Protection System: Seal for HVAC piping wall penetrations with wall mounted rigid plastic outlet cover and elastomeric wall seal gasket and having mechanical line insulation with PVC protective cover.
1. Wall Outlet Size, Stucco and Masonry Applications: 7-1/2 inches wide by 10 inches high (190.5 mm wide by 254 mm high).
a. Elastomeric Sleeve Diameter: 1-11/16 inches (43 mm) with applicable insulation thickness and PVC protective cover.
2. Outlet Cover Color: To be selected by Architect from manufacturer's standard line of colors.
3. PVC Insulation Cover Color: Black with full-length velcro fastener.

2.3 ACCESSORIES

A. Sealant for Joints in Linear Components: As recommended by component manufacturer.

B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

C. Roof Cement: ASTM D4586, Type I.

2.4 FINISHES

A. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Seal joints within components when required by component manufacturer.

C. Anchor components securely.

D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.

E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.

END OF SECTION 07 7100

SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-penetrating pedestals.

B. Snow guards.

1.2 RELATED REQUIREMENTS

A. Section 07 7100 - Roof Specialties: Other manufactured roof specialty items.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.
4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.

D. Warranty Documentation:

1. Submit manufacturer warranty.
2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 NON-PENETRATING ROOFTOP SUPPORTS/ASSEMBLIES

A. Manufacturers - Non-Penetrating Rooftop Assemblies:

B. Non-Penetrating Rooftop Support/Assemblies: Manufacturer-engineered and factory-fabricated, with pedestal bases that rest on top of roofing membrane, and not requiring any attachment to roof structure and not penetrating roofing assembly.

1. Design Loadings and Configurations: As required by applicable codes.

2. Height: Provide minimum clearance of 6 inches (152 mm) under supported items to top of roofing.
3. Support Spacing and Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
4. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
5. Hardware, Bolts, Nuts, and Washers: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A153/A153M.

C. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.

D. Non-Penetrating Pedestals: Steel pedestals with square, round, or rectangular bases.
1. Bases: High density polypropylene.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.

2.2 SNOW GUARDS

A. Unit Snow Guards: Individual projecting polycarbonate shapes, set between roofing shingles/tiles, and mechanically fastened to roof deck.
1. Projecting Polycarbonate Shapes: Clear polycarbonate plastic with UV stabilizers, semi-circular design.
2. Products:

B. Roof Membrane Fence Type Snow Guards: Base plate attached on top of EPDM, TPO, or PVC roof membrane and anchored to roof deck with mounting bracket that supports flat-faced bar or single tube snow guard.
1. Base Plate: Stainless steel plate with holes for mounting with anchor bolts through membrane to roof deck.
2. Bracket: Aluminum mounting bracket bolted to base plate.

C. Fence Type Snow Guard: Continuous snow guard; manufacturer's standard pipe, bar, channel, or solid rod, set in brackets or posts, with optional plates and metal trim to match roof.
1. Products:

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.4 CLEANING

A. Clean installed work to like-new condition.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 07 7200

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nonsag gunnable joint sealants.
B. Self-leveling pourable joint sealants.
C. Joint backings and accessories.
D. Owner-provided field quality control.

1.2 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.
B. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.3 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015 (Reapproved 2022).
B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants 2018 (Reapproved 2022).
C. ASTM C834 - Standard Specification for Latex Sealants 2017.
D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.
E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems 2016.
F. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.
G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2022.
H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.
I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints 2019 (Reapproved 2020).
J. SCAQMD 1168 - Adhesive and Sealant Applications 1989, with Amendment (2022).
K. SWRI (VAL) - SWR Institute Validated Products Directory Current Edition.
L. SWRI (VAL) - SWR Institute Validated Products directory; Sealant, Waterproofing and Restoration Institute; online at http://www.swrionline.org/ValidatedSealants.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
    1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
    2. List of backing materials approved for use with the specific product.
    3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
    4. Substrates the product should not be used on.
    5. Substrates for which use of primer is required.

6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
7. Sample product warranty.
8. Certification by manufacturer indicating that product complies with specification requirements.
9. SWRI Validation: Provide currently available sealant product validations as listed by SWRI (VAL) for specified sealants.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.

F. Sustainable Design Documentation: For sealants and primers, submit VOC content and emissions documentation; see Section 01 6116.

G. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

H. Installation Plan: Submit at least four weeks prior to start of installation.

I. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

J. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

K. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

L. Installation Log: Submit filled-out log for each length or instance of sealant installed.

M. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

N. Executed warranty.

1.5 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

E. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.

1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.

3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
4. Allow sufficient time for testing to avoid delaying the work.
5. Deliver sufficient samples to manufacturer for testing.
6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

F. Installation Plan: Include schedule of sealed joints, including the following:
1. Installation Log Form: Include the following data fields, with known information filled out.
a. Date of installation.
b. Name of installer.
c. Actual joint width; provide space to indicate maximum and minimum width.
d. Actual joint depth to face of backing material at centerline of joint.
e. Air temperature.

G. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
1. Identification of testing agency.
2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
a. Test date.
b. Copy of test method documents.
c. Age of sealant upon date of testing.
d. Test results, modeled after the sample form in the test method document.
e. Indicate use of photographic record of test.

H. Owner will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.

I. Field Quality Control Plan:
1. Visual inspection of entire length of sealant joints.
2. Nondestructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
a. For each different sealant and substrate combination, allow for one test every 12 inches (305 mm) in the first 10 linear feet (3 linear m) of joint and one test every 24 inches (610 mm) thereafter.
b. If any failures occur in the first 10 linear feet (3 linear m), continue testing at 12 inches (305 mm) intervals at no extra cost to Owner.
3. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.

a. For each different sealant and substrate combination, allow for one test every 100 feet (30 m) in the first 1,000 linear feet (305 linear m), and one test per 1,000 linear feet (305 linear m) thereafter, or once per floor on each elevation.
b. If any failures occur in the first 1,000 linear feet (305 linear m), continue testing at frequency of one test per 500 linear feet (152 linear m) at no extra cost to Owner.

4. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

J. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

K. Nondestructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.

L. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inches (457 mm) long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch (25.4 mm) by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.

M. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Nonsag Sealants:

1. Bostik Inc: www.bostik-us.com/#sle.
2. Dow: www.dow.com/#sle.
3. Hilti, Inc: www.hilti.com/#sle.
4. Pecora Corporation: www.pecora.com/#sle.
5. Tremco Global Sealants: www.tremcosealants.com.
6. Sherwin-Williams Company; [_____]: www.sherwin-williams.com/#sle.
7. Sika Corporation; [_____]: www.usa.sika.com/#sle.
8. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
9. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
10. Substitutions: See Section 01 6000 - Product Requirements.

2.2 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to:
   a. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.
   c. Joints between different exposed materials.
   d. Openings below ledge angles in masonry.
   e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
3. Do not seal the following types of joints:
   a. Intentional weep holes in masonry.
   b. Joints indicated to be treated with manufactured expansion joint cover, or some other type of sealing device.
   c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
   d. Joints where installation of sealant is specified in another section.
   e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use nonsag non-staining silicone sealant, unless otherwise indicated.

1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.

2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.
3. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.
1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
2. Wall and Ceiling Joints in Wet Areas: Nonsag polyurethane sealant for continuous liquid immersion.
3. Wall, Ceiling, and Floor Joints Where Tamper-Resistance is Required: Non-sag tamper-resistant silyl-terminated polyurethane sealant.
4. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; clear.

D. Interior Wet Areas: restrooms; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.3 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

B. Colors: As indicated on drawings.

2.4 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
3. Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
4. Color: Match adjacent finished surfaces.
5. Cure Type: Single-component, neutral moisture curing.
6. Service Temperature Range: Minus 20 to 180 degrees F (Minus 29 to 82 degrees C).
7. Products:
a. Dow; DOWSIL 756 SMS Building Sealant: www.dow.com/#sle.
b. Dow; DOWSIL 790 Silicone Building Sealant: www.dow.com/#sle.
c. Dow; DOWSIL 791 Silicone Weatherproofing Sealant: www.dow.com/#sle.
d. Pecora Corporation; 890FTS Field Tintable Ultra Low Modulus Architectural Silicone Sealant - Class 100: www.pecora.com.
e. Sika Corporation; Sikasil WS-295: www.usa.sika.com/#sle.
f. Sika Corporation; Sikasil 728NS: www.usa.sika.com/#sle.
g. Substitutions: See Section 01 6000 - Product Requirements.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Products:
a. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.

b. Sika Corporation; Sikasil GP: www.usa.sika.com/#sle.
c. Substitutions: See Section 01 6000 - Product Requirements.

C. Hybrid Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 15 to 25, Shore A, when tested in accordance with ASTM C661.
3. Color: Match adjacent finished surfaces.

D. Tamper-Resistant, Silyl-Terminated Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus [___] percent, minimum
2. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.
3. Color: Match adjacent finished surfaces.
4. Products:
a. Pecora Corporation; DynaTrol I-XL Hybrid: www.pecora.com/#sle.
b. Pecora Corporation; DynaFlex SC (Security Sealant): www.pecora.com/#sle.
c. Sika Corporation; SikaHyflex-150 LM: www.usa.sika.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

E. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
1. Movement Capability: Plus and minus 35 percent, minimum.
2. Color: Match adjacent finished surfaces.

F. Polysulfide Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Color: Match adjacent finished surfaces.

G. Acrylic-Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; paintable; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 12-1/2 percent, minimum.
2. Color: Standard colors matching finished surfaces.

H. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
1. Color: Standard colors matching finished surfaces, Type OP (opaque).
2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).
3. Products:
a. Pecora Corporation; AC-20 +Silicone: www.pecora.com/#sle.
b. Sherwin-Williams Company; White Lightning 3006 Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.
c. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com/#sle.

d. Substitutions: See Section 01 6000 - Product Requirements.

2.5 SELF-LEVELING JOINT SEALANTS

A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
   2. Hardness Range: 0 to 15, Shore A, when tested in accordance with ASTM C661.
   3. Color: To be selected by Architect from manufacturer's standard range.
   4. Service Temperature Range: Minus 40 to 180 degrees F (Minus 40 to 82 degrees C).
   5. Products:
      a. Dow; DOWSIL SL Parking Structure Sealant: www.dow.com/#sle.
      b. Pecora Corporation; Pecora 300 SL (Self-Leveling): www.pecora.com/#sle.
      c. Sika Corporation; Sikasil 728RCS: www.usa.sika.com/#sle.
      d. Tremco Commercial Sealants & Waterproofing; Spectrem 900SL: www.tremcosealants.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.

B. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .

2.6 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
   1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
   2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type C - Closed Cell Polyethylene.
   3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.

1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
2. Notify Architect of date and time that tests will be performed, at least seven days in advance.
3. Record each test on Preinstallation Adhesion Test Log as indicated.
4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.
B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

3.3 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Provide joint sealant installations complying with ASTM C1193.
C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.
D. Install bond breaker backing tape where backer rod cannot be used.
E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements for additional requirements.
B. Owner will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.
C. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet (30 linear m), notify Architect immediately.
D. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet (300 linear m), notify Architect immediately.

E. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

F. Repair destructive test location damage immediately after evaluation and recording of results.

3.5 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION 07 9200

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

1.2 RELATED REQUIREMENTS

A. Section 08 7100 - DOOR HARDWARE.

B. Section 09 9113 - Exterior Painting: Field painting.

1.3 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. ASCE: American Society of Civil Engineers.

C. HMMA: Hollow Metal Manufacturers Association.

D. NAAMM: National Association of Architectural Metal Manufacturers.

E. NFPA: National Fire Protection Association.

F. SDI: Steel Door Institute.

G. UL: Underwriters Laboratories.

1.4 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2022.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.

F. 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

H. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

I. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.

J. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

K. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.

L. ASTM C476 - Standard Specification for Grout for Masonry 2022.

M. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames 2016.

N. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

O. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames 2002.

P. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames 2011.

Q. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames 2017.
R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.
S. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2019.

1.5 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.6 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
B. Maintain at project site copies of reference standards relating to installation of products specified.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Hollow Metal Doors and Frames:
1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
2. De La Fontaine Inc: www.delafontaine.com.
3. Republic Doors: www.republicdoor.com.
4. Steelcraft, an Allegion brand: www.allegion.com/us.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PERFORMANCE REQUIREMENTS
A. Requirements for Hollow Metal Doors and Frames:
1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.

6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
7. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 3 - Extra Heavy-duty.
    b. Physical Performance Level A, 1,000,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
    e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
2. Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
4. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
5. Weatherstripping: Refer to Section 08 7100.
6. Door Finish: Factory primed and field finished.

2.4 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
3. Frame Finish: Factory primed and field finished.
4. Weatherstripping: Separate, see Section 08 7100.

C. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

2.5 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.6 ACCESSORIES

A. Astragals for Double Doors: Specified in Section 08 7100.

B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

2.7 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 08 7100.

3.4 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.6 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION 08 1113

SECTION 08 3613
SECTIONAL DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Overhead sectional doors, electrically operated.
B. Operating hardware and supports.
C. Electrical controls.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Rough wood framing for door opening.
B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
C. Section 26 0583 - Wiring Connections.

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.
B. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).
C. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014 (Reapproved 2021).
D. DASMA 102 - American National Standard Specifications for Sectional Doors 2018.
E. ITS (DIR) - Directory of Listed Products Current Edition.
F. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts 2008 (Reaffirmed 2020).
G. NEMA MG 1 - Motors and Generators 2021.
H. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
J. UL (DIR) - Online Certifications Directory Current Edition.
K. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
C. Product Data: Show component construction, anchorage method, and hardware.
D. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.
E. Operation Data: Include normal operation, troubleshooting, and adjusting.
F. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.
G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

C. Comply with applicable code for motor and motor control requirements.

D. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction, as suitable for purpose specified.

1.6 WARRANTY

A. See Section 01 7800 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for electric motor and transmission.

D. Provide five year manufacturer warranty for electric operating equipment.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Sectional Doors:

1. Clopay Corporation: www.clopaydoor.com.
2. Raynor Garage Doors: www.raynor.com/#sle.
3. Wayne-Dalton, a Division of Overhead Door Corporation: www.wayne-dalton.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 STEEL DOORS

A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.

1. Performance: Withstand positive and negative wind loads equal to 1.5 times design wind loads specified by local code without damage or permanent set, when tested in accordance with ASTM E330/E330M, using 10 second duration of maximum load.
2. Door Nominal Thickness: 2 inches (51 mm) thick.
3. Thermal Transmittance: U-factor (Usi-factor) of 0.31 Btu/hr sq ft degrees F (1.76 W/sq m K), maximum, in accordance with DASMA 102.
4. Air Leakage Rate: Less than 0.40 cfm/sf (2.0 L/sec/sq m) when tested in accordance with ASTM E283 at test pressure difference of 1.57 psf (75 Pa).
5. Exterior Finish: Factory finished with acrylic baked enamel; color as selected by Architect.
6. Interior Finish: Factory finished with acrylic baked enamel; color as selected from manufacturers standard line.
7. Manual Operation: Chain hoist.

B. Door Panels: Steel construction; outer steel sheet of 20 gage, 0.0359 inch (0.91 mm) minimum thickness, flush profile; inner steel sheet of 27 gage, 0.0164 inch (0.42 mm) minimum thickness, flat profile; core reinforcement sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; polyurethane insulation.

2.3 COMPONENTS

A. Track: Rolled galvanized steel, 0.090 inch (2.3 mm) minimum thickness; 2 inch (50 mm) wide, continuous one piece per side; galvanized steel mounting brackets 1/4 inch (6 mm) thick.

B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.

1. For Manual Operation: Requiring maximum exertion of 25 lbs (110 N) force to open.

D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

2.4 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.

B. Insulation: Foamed-in-place polyurethane, bonded to facing.

2.5 ELECTRIC OPERATION

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.

1. Provide interlock switches on motor operated units.

B. Electric Operators:

1. Mounting: Side mounted on cross head shaft.
2. Motor Enclosure:
   a. Exterior Doors: NEMA MG 1, Type 4; open drip proof.
3. 1/2 hp (375 W); manually operable in case of power failure, transit speed of 12 inches (300 mm) per second.
4. 120 volts, single phase, 60 Hz.
5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
6. Controller Enclosure: NEMA 250, Type 1.
7. Opening Speed: 12 inches per second (300 mm/s).
8. Brake: Adjustable friction clutch type, activated by motor controller.
9. Manual override in case of power failure.
10. Refer to Section 26 0583 for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. Control Station: Provide standard three button (Open-Close-Stop) momentary-contact control device for each operator complying with UL 325.

1. 24 volt circuit.
2. Surface mounted, at interior door jamb.
3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
    a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

E. Electric Operator: Center mounted draw bar assembly, adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter; mounting brackets and hardware.

F. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

G. Hand Held Transmitter: Digital control, and resettable.
1. Provide two transmitters per overhead door opener.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.2 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.3 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Install perimeter trim.

3.4 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch (1.5 mm).

B. Maximum Variation from Level: 1/16 inch (1.5 mm).

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch (3 mm) from 10 ft (3 m) straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.5 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.6 CLEANING

A. Clean doors and frames.

B. Remove temporary labels and visible markings.

3.7 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION 08 3613

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for hollow metal doors.
B. Thresholds.
C. Weatherstripping and gasketing.

1.2 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

1.3 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.
B. BHMA A156.1 - Standard for Butts and Hinges 2021.
C. BHMA A156.2 - Bored and Preassembled Locks and Latches 2017.
D. BHMA A156.4 - Door Controls - Closers 2019.
E. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.
F. BHMA A156.6 - Standard for Architectural Door Trim 2021.
G. BHMA A156.16 - Auxiliary Hardware 2018.
H. BHMA A156.18 - Materials and Finishes 2020.
I. BHMA A156.22 - Standard for Gasketing 2021.
J. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames 2016.
K. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.
L. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.
M. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.
N. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
B. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
    1. Hardware Installer.
    2. Owner's Security Consultant.
C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
D. Keying Requirements Meeting:
    1. Owner will schedule meeting at project site prior to Contractor occupancy.
    2. Attendance Required:
        a. Contractor.
        b. Owner.
        c. Hardware Installer.
    3. Agenda:
        a. Establish keying requirements.

b. Verify locksets and locking hardware are functionally correct for project requirements.
c. Verify that keying and programming complies with project requirements.
d. Establish keying submittal schedule and update requirements.

4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   a. Access control requirements.
   b. Key control system requirements.
   c. Schematic diagram of preliminary key system.
   d. Flow of traffic and extent of security required.
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
3. List groups and suffixes in proper sequence.
4. Provide complete description for each door listed.
5. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
6. Include account of abbreviations and symbols used in schedule.

D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1. Submit manufacturer's parts lists and templates.

F. Keying Schedule:
1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

G. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

H. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Lock Cylinders: Ten for each master keyed group.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.8 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
1. Closers: Five years, minimum.
2. Exit Devices: Three years, minimum.
3. Locksets and Cylinders: Three years, minimum.
4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
1. Applicable provisions of federal, state, and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.

D. Fasteners:
1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
a. Aluminum fasteners are not permitted.
b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.

2.2 HINGES

A. Hinges: Comply with BHMA A156.1, Grade 1.
1. Provide hinges on every swinging door.
2. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
3. Provide ball-bearing hinges at each door with closer.
4. Provide power transfer hinges where electrified hardware is mounted in door leaf.
5. Provide following quantity of butt hinges for each door:
a. Doors up to 60 inches (1.5 m) High: Two hinges.
b. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.
c. Doors 90 inches (2.3 m) High up to 120 inches (3 m) High: Four hinges.

2.3 FLUSH BOLTS

A. Flush Bolts: Comply with BHMA A156.16, Grade 1.
1. Flush Bolt Throw: 3/4 inch (19 mm), minimum.
2. Provide dustproof floor strike for bolt into floor, except at metal thresholds.
3. Manual Flush Bolts: Provide lever extensions for top bolt at over-sized doors.

2.4 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide standard, electronic, conventional, full size interchangeable core (FSIC), and small format interchangeable core (SFIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
2. Provide cylinders from same manufacturer as locking device.
3. Provide cams and/or tailpieces as required for locking devices.

2.5 CYLINDRICAL LOCKS

A. Manufacturers:
1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Best, dormakaba Group: www.bestaccess.com/#sle.
3. Schlage, an Allegion brand; [_____]: www.allegion.com/us/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
1. Bored Hole: 2-1/8 inch (54 mm) diameter.
2. Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
a. Finish: To match lock or latch.
b. Flat-Lip Strikes: Provide for locks with three piece antifriction latchbolts as recommended by manufacturer.
5. Provide a lock for each door, unless otherwise indicated that lock is not required.
6. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.6 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Hager Companies: www.hagerco.com/#sle.
3. Trimco: www.trimcohardware.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
1. Pull Type: Straight, unless otherwise indicated.
2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
a. Edges: Beveled, unless otherwise indicated.
3. Material: Aluminum, unless otherwise indicated.

2.7 COORDINATORS

A. Manufacturers:
1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. DORMA USA, Inc: www.dorma.com/#sle.
3. Trimco: www.trimcohardware.com/#sle.

B. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
1. Type: Bar, unless otherwise indicated.
2. Material: Aluminum, unless otherwise indicated.
3. Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

2.8 CLOSERS

A. Manufacturers; Surface Mounted:
1. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. LCN, an Allegion brand: www.allegion.com/us/#sle.
3. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Closers: Comply with BHMA A156.4, Grade 1.
1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.
3. Provide door closer on each fire-rated and smoke-rated door.
4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.
5. At outswinging exterior doors, mount closer on interior side of door.

2.9 KICK PLATES

A. Manufacturers:
1. Hiawatha, Inc, an Activar Construction Products Group company: www.activarcpg.com/hiawatha/#sle.
2. Ives, an Allegion brand: www.allegion.com/us/#sle.
3. Trimco: www.trimcohardware.com/#sle.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 36 inch (914 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.10 WALL STOPS

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Hager Companies: www.hagerco.com/#sle.
   3. Hiawatha, Inc, division of Activar Construction Products Group, Inc: www.activarcpg.com/hiawatha/#sle.
   4. Pamex, Inc: www.pamexinc.com/#sle.
   5. Trimco: www.trimcohardware.com/#sle.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Provide wall stops to prevent damage to wall surface upon opening door.
   2. Type: Bumper, concave, wall stop.
   3. Material: Aluminum housing with rubber insert.

2.11 ASTRAGALS

A. Astragals: Comply with BHMA A156.22.
   1. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
   2. Type: Split, two parts, and with sealing gasket.
   3. Material: Aluminum, with neoprene weatherstripping.
   4. Provide non-corroding fasteners at exterior locations.

2.12 WEATHERSTRIPPING AND GASKETING

A. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Adjustable.
   2. Material: Aluminum, with brush weatherstripping.
   3. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.

2.13 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Primary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
   2. Secondary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
      a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware for smoke and draft control doors in accordance with NFPA 105.

C. Use templates provided by hardware item manufacturer.

D. Do not install surface mounted items until application of finishes to substrate are fully completed.

E. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
2. For Steel Doors and Frames: See Section 08 1113.

F. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 4000 - Quality Requirements.

3.4 ADJUSTING

A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.5 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.6 PROTECTION

A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION 08 7100

SECTION 09 0561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

1.2 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

1.3 PRICE AND PAYMENT PROCEDURES

A. Alternate for Alternate Flooring Adhesive: Do not include the cost of the alternate adhesive in the base bid; state on the bid form the total additional cost for the alternate adhesive, installed, in the event such remediation is required.

1.4 REFERENCE STANDARDS

A. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings 2011.

1.5 ADMINISTRATIVE REQUIREMENTS

1.6 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:

1. Moisture and alkalinity (pH) limits and test methods.
2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report:

1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Copies of specified test methods.
4. Recommendations for remediation of unsatisfactory surfaces.
5. Submit report not more than two business days after conclusion of testing.

D. Copy of RFCI (RWP).

1.7 QUALITY ASSURANCE

A. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:

1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.

4. Achieve and maintain specified ambient conditions.
5. Notify Owner when specified ambient conditions have been achieved and when testing will start.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
B. Deliver materials in manufacturer's packaging; include installation instructions.
C. Keep materials from freezing.

1.9 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).
B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
b. Removal of existing floor covering.
2. Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
a. Do not attempt to remove coating or penetrating material.
b. Do not abrade surface.
3. Preliminary cleaning.
4. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
5. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
6. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
7. Specified remediation, if required.
8. Patching, smoothing, and leveling, as required.
9. Other preparation specified.
10. Adhesive bond and compatibility test.
11. Protection.

3.2 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.4 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.5 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.6 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 09 0561

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Gypsum wallboard.
- B. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS
- A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.3 REFERENCE STANDARDS
- A. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.
- B. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2022.
- C. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.
- D. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.
- E. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2021.
- F. GA-216 - Application and Finishing of Gypsum Panel Products 2021.

1.4 SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data:

1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 BOARD MATERIALS
- A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  1. Application: Use for ceilings, unless otherwise indicated.
  2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
     a. Basis of Design, Operating Rooms: XP® Drywall by National Gypsum
  3. Thickness:
     a. Ceilings: 5/8 inch (16 mm).
  4. Mold-Resistant, Paper-Faced Products:
     a. American Gypsum Company; M-Bloc Type C: www.americangypsum.com/#sle.
     b. Substitutions: See Section 01 6000 - Product Requirements.

2.2 GYPSUM BOARD ACCESSORIES

A. Joint Accessories and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.
   2. Expansion Joints: V-shaped PVC with tear away fins.

B. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Installation on Metal Framing: Use screws for attachment of gypsum board.

D. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.

3.3 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.4 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.5 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION 09 2116

SECTION 09 6700
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Fluid-applied flooring and base.

1.2 RELATED REQUIREMENTS

1.3 SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.4 QUALITY ASSURANCE

1.5 MOCK-UPS

1.6 DELIVERY, STORAGE, AND HANDLING

1.7 FIELD CONDITIONS

PART 2 PRODUCTS

2.1 FLUID-APPLIED FLOORING SYSTEMS
- A. Fluid-Applied Flooring: Epoxy base coat(s), with troweled aggregate.
  1. Aggregate: Quartz granules.
  2. Top Coat: Polyurethane.
  3. System Thickness: 1/8 inch (3.2 mm), nominal, dry film thickness (DFT).
  4. Texture: Slip resistant.
  5. Sheen: Matte.
  6. Color: As selected by Architect.
  7. Products:
     a. Citadel Floor Finishing Systems by Rust-Oleum Corporation; Citadel Decorative Quartz System - Single : www.citadelfloors.com/#sle.
     b. Elite Crete Systems; Hermetic Flake Flooring System: www.elitecrete.com/#sle.
     c. Rust-Oleum Corporation; CPS BriteCast Quartz System : www.rustoleum.com/#sle.
     d. Sika Corporation; Sikafloor DecoFlake System: www.sikafloorusa.com/#sle.
     e. SPARTACOTE, a division of LATICRETE International, Inc; SPARTACOTE and Epoxy Membrane with Surface Build Flake and Surface Build Top Coat UV: www.laticrete.com/#sle.
     f. Stonhard; Stontec TRF: www.stonhard.com/#sle.
     g. Stonhard; Stonshield SLT: www.stonhard.com/#sle.
     h. Substitutions: See Section 01 6000 - Product Requirements.

2.2 ACCESSORIES
- A. Base Caps: Extruded anodized aluminum with projecting base of 1/8 inch (3 mm); color as selected.
- B. Cant Strips: Molded of flooring resin material.
- C. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).

1. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.
2. Follow moisture and alkalinity remediation procedures in Section 09 0561.

E. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

B. Vacuum clean substrate.

C. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - ACCESSORIES

A. Install cant strips at base of walls where flooring is to be extended up wall as base.

B. Install terminating cap strip at top of base; attach securely to wall substrate.

3.4 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

D. Cove at vertical surfaces.

3.5 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.6 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION 09 6700

SECTION 09 9113
EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.
B. Field application of paints.
C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.
D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
   7. Floors, unless specifically indicated.
   8. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.3 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.4 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
E. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).
F. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.
5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
3. Allow 15 days for approval process, after receipt of complete samples by Architect.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
   2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.
   3. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.

B. Paints:
   1. Behr Process Corporation: www.behr.com/#sle.
   2. Benjamin Moore & Co: www.benjaminmoore.com.
   3. Glidden Professional, a product of PPG Architectural Coatings: www.gliddenprofessional.com.
   4. PPG Paints: www.ppgpaints.com/#sle.
   5. Rodda Paint Company: www.roddapaint.com/#sle.
   6. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   7. Valspar Corporation: www.valsparpaint.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
   3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
   4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
   5. Supply each paint material in quantity required to complete entire project's work from a single production run.
   6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated in Color Schedule.

1. Allow for minimum of two colors for each system, unless otherwise indicated, without additional cost to Contractor.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Alkyd Enamel; MPI #9, 81, 94, or 96.
   3. Top Coat Sheen:
      a. Satin: MPI gloss level 4; use this sheen at all locations.

B. Paint WE-TR-S - Wood, Transparent, Sealer, Optional Stain:
   1. One coat of stain.
   2. One coat of clear sealer.

C. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Rust-Inhibitive Water Based Primer; MPI #107.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
B. Patching Material: Latex filler.
C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.
B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
E. Test shop-applied primer for compatibility with subsequent cover materials.
F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   2. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
   3. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.
D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
E. Seal surfaces that might cause bleed through or staining of topcoat.
F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
G. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.
H. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION
A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
D. Apply each coat to uniform appearance.
E. Sand metal surfaces lightly between coats to achieve required finish.
F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
B. Owner will provide field inspection.

3.5 CLEANING
A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION
A. Protect finishes until completion of project.
B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 9113

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.
B. Field application of paints.
C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
   1. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 01 3329 - Sustainable Design Reporting.
B. Section 01 3515 - Certification Procedures - LEED 2009.
C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
D. Section 05 5000 - Metal Fabrications: Shop-primed items.
E. Section 09 9113 - Exterior Painting.

1.3 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.4 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2019.
B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).
C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2020.
D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.
E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.
F. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

G. SSPC-SP 6 - Commercial Blast Cleaning 2007.
H. SSPC-SP 13 - Surface Preparation of Concrete 2018.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.
C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Allow 30 days for approval process, after receipt of complete samples by Architect.
   3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
E. Manufacturer's Instructions: Indicate special surface preparation procedures.
F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 2 gallons ([_____] L) of each color;from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.8 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
2. Substitution of other products by the same manufacturer is preferred over substitution of products by a different manufacturer.
3. Substitution of a different paint system using MPI-approved products by the same manufacturer will be considered.

B. Paints:

1. Behr Process Corporation: www.behr.com/#sle.
2. Benjamin Moore & Co: www.benjaminmoore.com.
3. Diamond Vogel Paints: www.diamondvogel.com/#sle.
4. Glidden Professional, a product of PPG Architectural Coatings: www.gliddenprofessional.com.
5. PPG Paints: www.ppgpaints.com/#sle.
6. Rodda Paint Co: www.roddapaint.com/#sle.
7. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
8. Valspar Corporation: www.valsparpaint.com/#sle.

C. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by

manufacturer based on testing and field experience.

4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
5. Supply each paint material in quantity required to complete entire project's work from a single production run.
6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: See Section 01 6116.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.

1. Allow for minimum of two colors for each system, unless otherwise indicated, without additional cost to Bad Route Rest Area Rehab Project.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.
4. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, uncoated steel, and shop primed steel.

1. Two top coats and one coat primer.
2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
   a. Products:
      1) Sherwin-Williams Paint Shield Microbicidal Interior Acrylic Latex, Eg-Shel. (MPI #144)
3. Top Coat Sheen:
   a. Satin: MPI gloss level 4; use this sheen at all locations.
4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:

1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades.
2. Two top coats and one coat primer.
3. Top Coat(s): Interior Light Industrial Coating, Water Based; MPI #151, 153, or 154.
4. Top Coat Sheen:
   a. Satin: MPI gloss level 4; use this sheen at all locations.
5. Primer: As recommended by top coat manufacturer for specific substrate.

C. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including concrete masonry units.

1. Two top coats and one coat primer.
2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
   a. Products:
      1) Sherwin-Williams Paint Shield Microbicidal Interior Acrylic Latex, Eg-Shel. (MPI #144)
3. Top Coat Sheen:
   a. Satin: MPI gloss level 4; use this sheen at all locations.

2.4 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.

2.5 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
B. Patching Material: Latex filler.
C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.
B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
E. Test shop-applied primer for compatibility with subsequent cover materials.
F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
   4. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Remove or repair existing paints or finishes that exhibit surface defects.
D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
E. Seal surfaces that might cause bleed through or staining of topcoat.
F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
G. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi (10,350 to 27,580 kPa) at 6 to 12 inches (150 to 300 mm). Allow to dry.
3. Clean concrete according to ASTM D4258. Allow to dry.
4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

H. Masonry:

I. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

J. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

K. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 Commercial Blast Cleaning. Protect from corrosion until coated.

L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.7 SCHEDULE - PAINT SYSTEMS

A. Gypsum Board: Finish surfaces exposed to view.

B. Steel Doors and Frames: Finish surfaces exposed to view; MI-OP-3A, gloss.

C. Steel Fabrications: Finish surfaces exposed to view.

D. Shop-Primed Metal Items: Finish surfaces exposed to view.

1. Finish the following items:

a. Exposed surfaces of steel stairs and railings.

2. Interior: MI-OP-2A.

END OF SECTION 09 9123

SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Room and door signs.

1.2 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit one sampleof each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store tape adhesive at normal room temperature.

1.6 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Flat Signs:

1. Best Sign Systems, Inc: www.bestsigns.com/#sle.
2. Cosco Industries (ADA signs): www.coscoarchitecturalsigns.com/#sle.
3. Inpro: www.inprocorp.com/#sle.
4. Mohawk Sign Systems, Inc: www.mohawksign.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.2 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.

1. Sign Type: Flat signs with engraved panel media as specified.
2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and Grade II braille.
3. Character Height: 1 inch (25 mm).
4. Sign Height: 8 inches (203 mm), unless otherwise indicated.

2.3 SIGN TYPES

A. Flat Signs: Signage media without frame.

1. Edges: Square.
2. Corners: Square.
3. Wall Mounting of One-Sided Signs: Concealed screws.

B. Color and Font: Unless otherwise indicated:

1. Character Font: Helvetica, Arial, or other sans serif font.
2. Character Case: Upper case only.
3. Background Color: Clear.
4. Character Color: Contrasting color.

2.4 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:

1. Total Thickness: 1/16 inch (1.6 mm).

2.5 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Locate signs where indicated:

1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches (1525 mm) above finished floor.
2. If no location is indicated obtain Owner's instructions.

E. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION 10 1400

SECTION 10 2113.17
PHENOLIC TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Phenolic toilet compartments.

B. Urinal screens.

1.2 RELATED REQUIREMENTS

A. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.3 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Phenolic Toilet Compartments:

1. All American Metal Corp - AAMCO: www.allamericanmetal.com/#sle.
2. ASI Accurate Partitions: www.asi-accuratepartitions.com/#sle.
3. ASI Global Partitions: www.asi-globalpartitions.com/#sle.
4. Partition Systems International of South Carolina: www.psisc.com/#sle.
5. Substitutions: Section 01 6000 - Product Requirements.

2.2 PHENOLIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted unbraced.

1. Color: Single color as selected.

B. Doors:

1. Thickness: 3/4 inch (19 mm).
2. Width: 24 inch (610 mm).
3. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
4. Height: 58 inch (1473 mm).

C. Panels:

1. Thickness: 1/2 inch (13 mm).
2. Height: 58 inch (1473 mm).
3. Depth: As indicated on drawings.

D. Pilasters:

1. Thickness: 3/4 inch (19 mm).
2. Width: As required to fit space; minimum 3 inch (76 mm).

E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets with vertical support/bracing same as compartments.

2.3 ACCESSORIES

A. Pilaster Shoes: Formed ASTM A666 Type 304 stainless steel with No. 4 finish, 3 inch (76 mm) high, concealing floor fastenings.
   1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
   2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.

B. Head Rails: Hollow anodized aluminum, 1 inch by 1-1/2 inch (25 mm by 38 mm) size, with anti-grip profile and cast socket wall brackets.

C. Wall and Pilaster Brackets: Polished stainless steel; manufacturer's standard type for conditions indicated on drawings.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
   1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

E. Hardware: Polished stainless steel:
   1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
   2. Nylon bearings.
   3. Door Latch: Slide type with exterior emergency access feature.
   4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
   5. Coat hook with rubber bumper; one per compartment, mounted on door.
   6. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION

A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.

B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.

C. Attach panel brackets securely to walls using anchor devices.

D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

A. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.4 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 10 2113.17

SECTION 10 2600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Protective wall covering.

1.2 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics 2010 (Reapproved 2018).

B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents 2021.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies 2023.

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

1. Submit two samples of protective wall covering and door surface protection, 6 by 6 inches (152 by 152 mm) square.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Stock Materials: 64 square feet (6 square meters) of each kind of protective wall covering and door surface protection.

H. Maintenance Data: Manufacturer's instructions for care and cleaning of each type of product. Include information about both recommended and potentially detrimental cleaning materials and methods.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect work from moisture damage.

B. Protect work from UV light damage.

C. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

D. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.5 WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Protective Wall Covering:

1. Construction Specialties, Inc: www.c-sgroup.com/#sle.
2. Inpro: www.inprocorp.com/#sle.
3. MDC Interior Solutions: www.mdcwall.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.2 PERFORMANCE CRITERIA

A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.

B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.

C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.3 PRODUCT TYPES

A. Protective Wall Covering:

1. Material: High-impact acrylic-modified vinyl.
2. Thickness: 0.040 inch (1.02 mm).
3. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
4. Color: As selected from manufacturer's standard colors.
5. Accessories: Provide manufacturer's standard color-matched trim and moldings.
6. Mounting: Adhesive.

B. Adhesives and Primers: As recommended by manufacturer.

2.4 FABRICATION

A. Fabricate components with tight joints, corners and seams.

2.5 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that field measurements are as indicated on drawings.

C. Verify that substrate surfaces for adhered items are clean and smooth.

1. Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.

D. Start of installation constitutes acceptance of project conditions.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position protective wall covering no less than 1 inch (25.4 mm) above finished floor to allow for floor level variation.

1. Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
2. Apply adhesive with 1/8 inch (3.2 mm) V-notch trowel to an area of wall surface that can be completed within cure time of the adhesive.
3. At joints indicated to be caulked, allow for a minimum 1/16 inch (1.6 mm) wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
4. Use a roller to ensure maximum contact with adhesive.

3.3 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch (6 mm).

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch (6 mm).

3.4 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 10 2600

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Section 22 4000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.2 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2022).

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

D. ASTM C1036 - Standard Specification for Flat Glass 2021.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

F. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2021.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use 2022.

I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).

J. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.3 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Electric Hand/Hair Dryers:

1. American Specialties, Inc: www.americanspecialties.com/#sle.
2. Dyson Inc: www.dyson.com/#sle.
3. Excel Dryer: www.exceldryer.com/#sle.
4. Substitutions: Section 01 6000 - Product Requirements.

B. Diaper Changing Stations:

1. American Specialties, Inc: www.americanspecialties.com/#sle.
2. Bradley Corporation: www.bradleycorp.com/#sle.
3. Koala Kare Products: www.koalabear.com/#sle.
4. Substitutions: 01 6000 - Product Requirements.

C. Provide products of each category type by single manufacturer.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide two keys for each accessory to Contractor; master key lockable accessories.
C. Stainless Steel Sheet: ASTM A666, Type 304.
D. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
E. Adhesive: Two component epoxy type, waterproof.
F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.4 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.
   1. Attached Purse Shelf: 0.03 inch (0.8 mm) satin finished stainless steel, with rolled or formed edge at front.
B. Waste Receptacle: Recessed, stainless steel, seamless lower door for access to container, with tumbler lock, reinforced panel full height of door, push-in self-closing top door, continuously welded bottom pan and seamless exposed flanges.
   1. Liner: Removable seamless stainless steel receptacle.
C. Automated Soap Dispenser: Liquid soap dispenser, wall-mounted, with stainless steel cover and window to gauge soap level, tumbler lock.
   1. Minimum Capacity: 40 ounces (1.4 liters).
D. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick tempered safety glass; ASTM C1048.
   1. Size: Refer to drawings.
   2. Frame: 0.05 inch (1.3 mm)angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
   3. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
   4. Shelf: Stainless steel; gauge and finish to match mirror frame, turned down edges, welded to frame; 5 inches (125 mm) deep, full width of mirror.
E. Seat Cover Dispenser: Stainless steel, surface-mounted, reloading by concealed opening at base, tumbler lock.
   1. Minimum capacity: 250 seat covers.
F. Grab Bars: Stainless steel, smooth surface.
   1. Heavy Duty Grab Bars: Floor supports are not acceptable.
      a. Push/Pull Point Load: Minimum 1000 pound-force (4448.2 N), minimum.
      b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.125 inch (3.17 mm) wall thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
      c. Length and Configuration: As indicated on drawings.
G. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.

2.5 UNDER-LAVATORY PIPE AND SUPPLY COVERS
- A. Specified in 22 4000 - Plumbing Fixtures.

2.6 ELECTRIC HAND/HAIR DRYERS
- A. Electric Hand Dryers: Traditional fan-in-case type, with downward fixed nozzle.
  1. Operation: Automatic, sensor-operated on and off.
  2. Mounting: Wall-mounted - surface.
  3. Cover: Epoxy painted steel or die-cast zinc alloy.
     a. Color: White.
     b. Tamper-resistant screw attachment of cover to mounting plate.
     c. Screened or shielded air intake.
     d. Screen or shield to prevent access to motor/heater.
  4. Air Velocity: 15,000 linear feet per minute (76 m/s), minimum.
  5. Fan Control: Field adjustable down to approximately half-speed.
  6. Total Wattage: 500 W, maximum; no heater.
  7. Runtime: Field adjustable or automatic, up to 35 seconds.

2.7 DIAPER CHANGING STATIONS
- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
  1. Material: Polyethylene.
  2. Mounting: Surface.
  3. Color: White.
  4. Minimum Rated Load: 250 pounds (113.4 kg).

PART 3 EXECUTION

3.1 EXAMINATION
- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION
- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION
- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
  1. Grab Bars: As indicated on drawings.

3.4 PROTECTION
- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 2800

SECTION 220519
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid Meters:
   1. Disc meters.

B. Pressure Gauges:
   1. Bourdon tube for liquids and gases.

C. Thermometers.

D. Pressure-Temperature test plugs.

1.02 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers 2014.

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers 2014 (Reapproved 2021).

D. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance 2012, with Addendum (2018).

E. NSF 61 - Drinking Water System Components - Health Effects 2020.

F. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.03 SUBMITTALS

A. Product Data: Provide red-marked product data sheets for each furnished item with associated components and accessories.

PART 2 PRODUCTS

2.01 LIQUID METERS

A. Disc Meters:
   1. Utility Connection Size: 1-1/2 inch (40 mm) NPT female.
   2. Remote Monitoring: Magnetic register with built-in AMR pulse (binary) output.
   3. Lead-free bronze alloy case and cap with hermetically-sealed mechanical register.
   4. Pressure and Temperature: Up to 150 psi (10 bar) and 100 degrees F (38 degrees C).

2.02 PRESSURE GAUGES

A. Bourdon Tube for Liquids and Gases:
   1. Dial Size and Cover: 4-1/2 inch (115 mm) diameter scale with polycarbonate window.
   2. Dial Text and Markings: Black color on white background with scaled kPa and psi units.
   3. Accuracy: ASME B40.100, adjustable commercial grade (D) with 5 percent of span.
   4. Process Connection: Lower-back, 1/4 inch (6.35 mm) NPT male except where noted.

B. Accessories:
   1. Gauge Cock: Carbon steel with tee or lever handle for maximum 150 psi (1034 kPa).
   2. Needle Valve: Carbon steel, 1/4 inch (6 mm) NPT female for noncorrosive service.
   3. Coil Siphon: 213 seamless steel, 1/4 inch (6.35 mm) NPT male for rated capacity.
   4. Pressure Snubber (Pulsation Damper): Brass, 1/4 inch (6.35 mm) NPT male.

2.03 THERMOMETERS

A. General:
   1. Product Compliance: ASTM E1.

2. Lens: Clear glass, except where stated.
3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

B. Thermometers - Adjustable Angle: 7 inch (177.8 mm) v-shape aluminum case with clear glass window scale, 6 inch (152.4 mm) NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

2.04 PRESSURE-TEMPERATURE TEST PLUGS:

A. Size: 500 psi (34.5 bar) capacity; 1/2 inch (13 mm) MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch (3 mm) pressure gauge or temperature probe.

B. Wetted Materials per Temperature Range:
1. Up to 200 degrees F (93 degrees C): Brass probe with neoprene core.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.

B. Install water meters with inlet and outlet isolation valves in compliance with AWWA M6.

C. Install pressure gauges as follows:
1. At Pumps: Place single gauge before strainer, suction side and discharge side.
2. Include gauge cock to isolate each gauge and extend nipples for insulation clearance.
3. Include siphons on high temperature systems and select type according to service rating.
4. Adjust gauges to selected viewing angle, clean thoroughly, and calibrate to zero.

D. Install thermometers as follows:
1. Hot Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.
2. Piping: Install thermometers in branch butt weld connection fitting or socket-weld thermowell. Enlarge pipes smaller than 2-1/2 inch (60 mm) to accommodate sockets. Ensure sockets are above insulation clearance.

END OF SECTION 220519

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.

B. Check valves.

1.02 RELATED REQUIREMENTS

A. Section 220719 - Plumbing Piping Insulation.

B. Section 221005 - Plumbing Piping.

1.03 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2020.

C. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves 2022.

D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.

E. ASME B16.34 - Valves — Flanged, Threaded, and Welding End 2020.

F. ASME B31.9 - Building Services Piping 2020.

G. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.

H. AWWA C606 - Grooved and Shouldered Joints 2015.

I. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends 2011.

J. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends 2018.

K. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves 2019.

L. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .

M. NSF 61 - Drinking Water System Components - Health Effects 2020.

N. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.04 SUBMITTALS

A. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball.
   2. Swing Check (Pump Outlet):

a. 2 NPS (50 DN) and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

B. Domestic, Hot and Cold Water Valves:
1. 2 NPS (50 DN) and Smaller:
a. Bronze and Brass: Provide with solder-joint, threaded, or press ends.
b. Ball: One piece, full port, brass with brass trim.
c. Bronze Swing Check: Class 125, bronze disc.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
1. Hand Lever: Quarter-turn valves 6 NPS (150 DN) and smaller.

D. Valves in Insulated Piping: With 2 NPS (50 DN) stem extensions and the following features:
1. Gate Valves: Rising stem.
2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Solder Joint Connections: ASME B16.18.
4. Grooved End Connections: AWWA C606.

F. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Solder-joint Connections: ASME B16.18.
3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

2.03 BRASS, BALL VALVES

A. One-Piece, Reduced-Port with Brass Trim:
1. Comply with MSS SP-110.
2. Body: Forged brass.
3. Ends: Threaded.
4. Seats: PTFE.
5. Stem: Brass.
6. Ball: Chrome-plated brass.

B. Two Piece, Full Port with Brass Trim and Threaded Connections:
1. Comply with MSS SP-110.
2. SWP Rating: 150 psig (1035 kPa).
3. CWP Rating: 600 psig (4140 kPa), WOG.
4. Body: Forged brass.
5. Seats: PTFE.
6. Ball: Chrome-plated brass.

C. Two Piece, Full Port with Press Connection:

1. CWP Rating: 250 psig (1,724 kPa), WOG.
2. Body: Forged brass.
3. Seats: EPDM.
4. Ball: Chrome-plated brass.
5. Blow-out Proof Stem: Forged brass.
6. Maximum Service Temperature: 250 deg F (121.1 deg C).

2.04 BRONZE, BALL VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. One Piece, Reduced Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 400 psig (2760 kPa).
   3. CWP Rating: 600 psig (4140 kPa).
   4. Body: Bronze.
   5. Ends: Press.
   6. Seats: PTFE.

C. Two Piece, Full Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 150 psig (1035 kPa).
   3. CWP Rating: 600 psig (4140 kPa).
   4. Body: Forged bronze or dezincified-brass alloy.
   5. Ends: Threaded.
   6. Seats: PTFE.

2.05 BRONZE, SWING CHECK VALVES

A. General:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125 CWP Rating; 200 psig (1,380 kPa) WOG:
   1. Comply with MSS SP-80, Type 3.
   2. Design: Y-pattern, horizontal or vertical flow.
   3. Body: Bronze, ASTM B62.
   4. Ends: Threaded.
   5. Disc: Bronze.

PART 3 EXECUTION

3.01 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

END OF SECTION 220523

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, piping, and other plumbing work.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

D. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2022).

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

G. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.

H. MFMA-4 - Metal Framing Standards Publication 2004.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

1.04 QUALITY ASSURANCE

A. Comply with applicable building code.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems:
1. Comply with MFMA-4.
2. Channel Material:
    a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
4. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

D. Thermal Insulated Pipe Supports:
1. General Construction and Requirements:
    a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch (12.7 mm to 762 mm) iron pipes.
    d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.
2. PVC Jacket:
    a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
    b. Moisture Vapor Transmission: 0.0071 perm inch (0.0092 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
    c. Thickness: 60 mil (1.524 mm).

E. Pipe Supports:
1. Liquid Temperatures Up To 122 degrees F (50 degrees C):
    a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
    b. Support From Below: MSS SP-58 Types 35 through 38.

F. Strut Clamps: Two-piece pipe clamp.

G. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.

H. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

I. Pipe Shields for Insulated Piping:
1. General Construction and Requirements:
    a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
    b. Shields Material: UV-resistant polypropylene with glass fill.
    c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
    d. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
    e. Maximum Service Temperature: 178 degrees F (81 degrees C).
    f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

J. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Steel: Use beam clamps, machine bolts, or welded threaded studs.
   6. Wood: Use wood screws.
   7. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
      a. Comply with MFMA-4.
      b. Channel Material: Use galvanized steel.
      c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

K. Pipe Installation Accessories:
   1. Copper Pipe Supports:
      a. Manufacturers:
         1) HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

END OF SECTION 220529

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.

1.03 SUBMITTALS

A. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:
   1. Heat exchangers, water heaters, and other heat transfer products.
   2. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:
   1. Piping: 3/4 inch (20 mm) diameter and smaller.
   2. Manual operated and automated control valves.
   3. Instrumentation, relays, gauges, and other related control equipment products.

C. Pipe Markers: 3/4 inch (20 mm) diameter and higher.

2.02 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.
   1. Letter Color: White.
   2. Letter Height: 1/4 inch (6 mm).

2.03 TAGS

A. Metal: Brass, 19 gauge 1-1/2 inch (40 mm) in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

B. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

2.04 PIPE MARKERS

A. Comply with ASME A13.1.

B. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

C. Flexible Tape Marker: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

D. Identification Scheme, ASME A13.1:
   1. Primary: External Pipe Diameter, Uninsulated or Insulated.
      a. 3/4 to 1-1/4 inches (19 to 32 mm): Use 8 inch (203 mm) field-length with 1/2 inch (13 mm) text height.
      b. 1-1/2 to 2 inches (38 to 51 mm): Use 8 inch (203 mm) field-length with 3/4 inch (19 mm) text height.
      c. 2-1/2 to 6 inches (64 to 152 mm): Use 12 inch (305 mm) field-length with 1-1/4 inch (32 mm) text height.

d. 8 to 10 inches (204 to 254 mm): Use 24 inch (610 mm) field-length with 2-1/2 inch (64 mm) text height.

2. Secondary: Color scheme per fluid service.
   a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.02 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

E. Apply ASME A13.1 Pipe Marking Rules:
   1. Place pipe marker adjacent to changes in direction.
   2. Place pipe marker adjacent each valve port and flange end.
   3. Place pipe marker at both sides of floor and wall penetrations.
   4. Place pipe marker every 25 to 50 feet (7.6 to 15.2 m) interval of straight run.

END OF SECTION 220553

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Glass fiber insulation.

C. Jacket insulation.

1.02 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping: Placement of hangers and hanger inserts.

1.03 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.

B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2023.

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2022a.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.06 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. K (Ksi) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
   2. Maximum Service Temperature: 220 degrees F (104 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

C. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 220 degrees F (104 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

2.04 JACKET INSULATION

A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil (0.25 mm).
      e. Connections: Brush on welding adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

END OF SECTION 220719

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, above grade.

B. Domestic water piping, above grade.

C. Pipe flanges, unions, and couplings.

D. Pipe hangers and supports.

E. Ball valves.

F. Balancing valves.

G. Strainers.

1.02 RELATED REQUIREMENTS

A. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment.

B. Section 220553 - Identification for Plumbing Piping and Equipment.

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems 2015 (Reaffirmed 2020).

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2021.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.

D. ASME B31.9 - Building Services Piping 2020.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2022).

F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

G. ASTM B32 - Standard Specification for Solder Metal 2020.

H. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.

I. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.

J. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.

K. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 2021a.

L. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series) 2020.

M. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40 2021.

N. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems 2020.

O. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2020.

P. AWWA C606 - Grooved and Shouldered Joints 2015.

Q. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2021.

R. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2020.

S. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).

T. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .

U. NSF 61 - Drinking Water System Components - Health Effects 2020.

V. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: CISPI 301, hubless, service weight.
   1. Fittings: Cast iron.
   2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

B. PVC Pipe: ASTM D1785 Schedule 40, or ASTM D2241 SDR 26 with not less than 150 psi (1 034 kPa) pressure rating.
   1. Fittings: ASTM D2466, PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, alloy Sn95 solder.
   3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

2.04 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 2 inch (80 mm, DN) and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.
   2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Sizes Over 2-1/2 inch (25 mm, DN):
   1. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Housing Material: Provide ASTM A47/A47M malleable iron or ductile iron, galvanized.
   3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. No-Hub Couplings:
   1. Gasket Material: Neoprene complying with ASTM C564.
   2. Band Material: Stainless steel.
   3. Eyelet Material: Stainless steel.

E. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.05 PIPE HANGERS AND SUPPORTS

A. See Section 220529 for additional requirements.

B. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
   2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
   3. Trapeze Hangers: Welded steel channel frames attached to structure.
   4. Vertical Pipe Support: Steel riser clamp.
   5. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
      a. Bases: High-density polypropylene.
      b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
      c. Steel Components: Stainless steel or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
      d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion-resistant material.
      e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.

C. Plumbing Piping - Drain, Waste, and Vent:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Carbon steel, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.

D. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Carbon steel, adjustable swivel, split ring.
   2. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

E. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Comply with ICC-ES AC01.
   3. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
   4. Other Types: As required.

2.06 BALL VALVES

A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded or grooved ends.

2.07 BALANCING VALVES

A. Construction: Class 125, brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

B. Manual Operated Y-Pattern Globe, Size 1/2 to 2 inch (15 to 50 mm, DN):
   1. Class 125, brass or bronze body, multi-turn handwheel, memory stop, variable orifice, soldered connections, dual PT (hot and cold pressure-temperature) test ports for 300 psi (2,068 kPa), minus 4 to 250 deg F (minus 20 to 121.1 deg C) WOG service.

C. Calibration: Control flow within five percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi (24 kPa).

2.08 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

2.09 STRAINERS

A. Size 1/2 inch (15 mm, DN) to 3 inch (80 mm, DN):
   1. Class 150, threaded forged bronze Y-pattern body, stainless steel perforated mesh screen with cap, and rated for 150 psi (1,034 kPa), 250 deg F (121.1 deg C) WOG service.

B. Size 2 inch (50 mm, DN) and Smaller:
   1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

C. Size 1-1/2 inch (40 mm, DN) to 4 inch (100 mm, DN):
   1. Class 125, flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

F. Install valves with stems upright or horizontal, not inverted. See Section 220523.

G. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

H. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

I. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   3. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   4. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.04 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.05 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:
   1. Perform hydrostatic testing for leakage prior to system disinfection.
   2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
   3. General:
      a. Fill the system with water and raise static head to 10 psi (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).

C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.06 SCHEDULES

A. Pipe Hanger Spacing:
   1. Metal Piping:
      a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
         1) Maximum Hanger Spacing: 6.5 ft (2 m).
         2) Hanger Rod Diameter: 3/8 inches (9 mm).
      b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).
      c. Pipe Size: 2-1/2 inch (65 mm, DN) to 3 inch (80 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 1/2 inch (13 mm).
      d. Pipe Size: 4 inch (100 mm, DN) to 6 inch (150 mm, DN):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 5/8 inch (15 mm).

END OF SECTION 221005

SECTION 221006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Hydrants.

E. Water hammer arrestors.

F. Mixing valves.

G. Relief valves.

1.02 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping.

B. Section 224000 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains 2019.

B. NSF 61 - Drinking Water System Components - Health Effects 2020.

C. NSF 372 - Drinking Water System Components - Lead Content 2020.

D. PDI-WH 201 - Water Hammer Arresters 2017.

1.04 SUBMITTALS

A. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Floor Drains:

B. Floor Drain (FD-1):

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.03 CLEANOUTS

A. Cleanouts at Interior Finished Floor Areas:

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

B. Cleanouts at Interior Finished Wall Areas:

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

2.04 HOSE BIBBS

A. Interior Hose Bibbs:

2.05 HYDRANTS

A. Wall Hydrants:

2.06 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.07 MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.

2.08 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Install floor cleanouts at elevation to accommodate finished floor.

D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

E. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to high velocity flushing devices.

END OF SECTION 221006

SECTION 221123
DOMESTIC WATER PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. End-suction pumps.

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NSF 61 - Drinking Water System Components - Health Effects 2020.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Include dimensions and performance data.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

D. Project Record Documents: Record actual locations of components.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Identification: Provide pumps with manufacturer's name, model number, and rated capacity identified by permanently attached label.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 END-SUCTION PUMPS

A. Description: Close-coupled, end-suction pump and NPT threaded pipe-end connections.

B. Pump Configuration: Single-stage, single-suction type with top discharge outlet.

C. Casing: Stainless steel with stainless steel seal disc and seal flush connection.

D. Impeller: composite, fully enclosed, keyed directly to solid alloy steel with carbon sleeve shaft.

E. Seal: Mechanical, single spring type, for 225 degrees F (107 degrees C) service.

F. Electrical:
   1. 120 VAC, three phase, 60 Hz.
   2. Motor Controller: Local disconnect and included pressure switch.
   3. Motor Protection: Includes built-in thermal switch..
   4. Wiring Connections: See Section 260583.
   5. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

G. Integral Controls:
   1. Pressure switch: Factory-fitted pressure switch to control pump operation.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products with related fittings, and accessories according to manufacturer instructions.

B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).

C. Ensure that small pressure gauges are installed on both upstream and downstream ends.

D. Factory-Provided Pump Controls: Factory provided, tested for use.

E. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are nonoverloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.02 FIELD QUALITY CONTROL

A. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.03 CLEANING

A. Thoroughly clean plumbing fixtures and equipment.

3.04 PROTECTION

A. Protect installed products from damage due from subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION 221123

SECTION 223000
PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water heaters.

B. Diaphragm-type compression tanks.

C. Reverse osmosis equipment.

1.02 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NEMA MG 1 - Motors and Generators 2021.

C. UL 174 - Standard for Household Electric Storage Tank Water Heaters Current Edition, Including All Revisions.

D. UL 778 - Standard for Motor-Operated Water Pumps Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data:
   1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
   2. Indicate pump type, capacity, power requirements.
   3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
   4. Provide electrical characteristics and connection requirements.

B. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.01 WATER HEATERS

A. Residential Electric:
   1. Type: Automatic, electric, vertical storage.
   2. Performance:
      a. Storage Capacity: 40 gal (151 L).
      b. Heating Element Size: 4.5 kW.
      c. Minimum Recovery Rate: 21 gph (79 L/s) with 90 degrees F (32 degrees C) temperature rise.
   3. Electrical Characteristics:
   4. Accessories:
      a. Water Connections: Brass.
      b. Dip Tube: Crosslink polyethylene (PEX).

c. Drain valve.
d. Anode: Aluminum with steel core.
e. Temperature and Pressure Relief Valve: ASME labeled.

2.02 DIAPHRAGM-TYPE COMPRESSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig (860 kPa), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig (80 kPa).

2.03 REVERSE OSMOSIS EQUIPMENT

A. Piping, Equipment, and Controls: Factory mounted on steel frame.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Coordinate with plumbing piping and related fuel piping work to achieve operating system.

C. Pumps:
1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION 223000

SECTION 224000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush valve water closets.

B. Wall hung urinals.

C. Lavatories.

D. Outdoor drinking fountains.

E. Bottle filling drinking fountains.

F. Service sinks.

1.02 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping.

B. Section 221006 - Plumbing Piping Specialties.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design 2010.

B. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).

C. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.

D. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.

E. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2022.

F. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2020.

G. NSF 61 - Drinking Water System Components - Health Effects 2020.

H. NSF 372 - Drinking Water System Components - Lead Content 2020.

1.04 SUBMITTALS

A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 FLUSH VALVE WATER CLOSETS

A. Water Closets: Stainless steel, ASME A112.19.3, wall hung, siphon jet flush action.
   1. Bowl: ASME A112.19.3; 16.5 inches (420 mm) high with elongated rim.
   2. Flush Valve: Concealed (back spud).
   3. Flush Operation: Sensor operated.
   4. Inlet Size: 1-1/2 inches (38 mm).
   5. Trapway Outlet: 4 inch (100 mm, DN).
   6. Color: Stainless steel.

B. Flush Valves:
   1. Valve Supply Size: 1 inch (25 mm, DN).
   2. Valve Outlet Size: 1-1/2 inches (40 mm, DN).
   3. Sensor-Operated:
      a. Type: ASME A112.19.5; chloramine-resistant clog-resistant dual-seat diaphragm valve complete with vacuum breaker stops and accessories.
      b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with low-voltage powered infrared sensor, and mechanical over-ride or over-ride push button.
      c. Supplied Volume Capacity: 1.6 gal/flush (6.1 Liters/flush).
   4. Concealed Type: Rough brass, exposed parts chrome plated, wall escutcheon, wheel handle stop.

C. Water Closet Carriers:
   1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.03 WALL HUNG URINALS

A. Urinals: Stainless steel, ASME A112.19.3, wall hung.
   1. Flush Volume: 0.5 gallons (1.9 liters), maximum.
   2. Flush Valve: Concealed (back spud).
   3. Flush Operation: Sensor operated.
   4. Trapway Outlet: Integral.
   5. Removable stainless steel strainer.
   6. Supply Size: 3/4 inch (19 mm).
   7. Outlet Size: 1-1/2 inches (38 mm).

B. Flush Valves:
   1. Sensor-Operated:
      a. Type: ASME A112.19.5; chloramine-resistant clog-resistant dual-seat diaphragm valve complete with vacuum breaker stops and accessories.
      b. Mechanism: Solenoid-operated piston or electronic motor-actuated operator with low-voltage powered infrared sensor, and mechanical over-ride or over-ride push button.
      c. Supplied Volume Capacity: 1.1 gal/flush (4.2 Liters/flush).
   2. Concealed Type: Rough brass, exposed parts chrome plated, wall escutcheon, wheel handle stop.

C. Wall-Hung Urinal Carriers:
   1. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

A. Stainless Steel Wall Hung Basin: ASME A112.19.3; stainless steel wall-hung lavatory, with 4 inch (100 mm) high back, single center hole drilling, rectangular basin, and soap depression.

B. Sensor Operated Faucet: Cast brass, chrome plated, wall mounted with sensor located on neck of spout.
   1. Spout Style: Standard.
   2. Power Supply: 6 VDC, field-wired into dedicated or common power supply.
   3. Mixing Valve: Thermostatic mixing valve included with faucet.
   4. Water Supply: 3/8 inch (9 mm) compression connections.
   5. Aerator: Vandal resistant, 1.5 gmp (5.7 Lpm), laminar flow device.
   6. Automatic Shut-off: 30 seconds.
   7. Finish: Polished chrome.

C. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

2.05 OUTDOOR DRINKING FOUNTAINS

A. Fountain: 316 stainless steel with underside vandal proof cowling, hooded elevated anti-squirt bubbler with stream guard, automatic stream regulator, bottle filler, push button handles, mounting bracket, screwdriver stop.

2.06 BOTTLE FILLING DRINKING FOUNTAINS

A. Bottle Filler: Materials to match fountain.

2.07 SERVICE SINKS

A. Bowl: ASME A112.19.1; 22 by 18 by 12 inch (560 by 460 by 300 mm) deep, porcelain enamelled (inside only) cast iron roll-rim sink, with 12 inch (300 mm) high back, concealed hanger, chrome plated strainer, stainless steel rim guard, cast iron P-trap with adjustable floor flange.

B. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

3.04 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 CLEANING

A. Clean plumbing fixtures and equipment.

3.06 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 224000

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Single phase electric motors.

C. Electronically Commutated Motors (ECM).

1.02 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators 2021.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.04 WARRANTY

A. Provide five year manufacturer warranty for motors.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 SINGLE PHASE POWER - SPLIT PHASE MOTORS

A. Starting Torque: Less than 150 percent of full load torque.

B. Starting Current: Up to seven times full load current.

C. Breakdown Torque: Approximately 200 percent of full load torque.

D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.

E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.03 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

A. Starting Torque: Exceeding one fourth of full load torque.

B. Starting Current: Up to six times full load current.

C. Multiple Speed: Through tapped windings.

D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.04 ELECTRONICALLY COMMUTATED MOTORS (ECM)

A. Applications:
   1. Residential:
      a. Air Handling Unit:
         1) Operating Mode: Constant cfm.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the air handling unit.
      b. Condenser Fan:
         1) Operating Mode: Constant speed.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the condenser fan.
         3) RPM: 300 through 1800.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION 230513

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

D. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2022).

E. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

G. MFMA-4 - Metal Framing Standards Publication 2004.

H. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
   1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.

C. Manufacturer's 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.

1.05 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.

C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch (13 mm) diameter.
      b. Piping up to 1 inch (27 mm) nominal: 1/4 inch (6 mm) diameter.
      c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch (10 mm) diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch (10 mm) diameter.

D. Pipe Supports:
   1. Liquid Temperatures Up To 122 degrees F (50 degrees C):
      a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
      b. Support From Below: MSS SP-58 Types 35 through 38.
   2. Operating Temperatures from 122 to 446 degrees F (50 to 230 degrees C):
      a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.

E. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
   1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
   2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

F. Pipe Shields for Insulated Piping:
   1. General Construction and Requirements:
      a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
      b. Shields Material: UV-resistant polypropylene with glass fill.

c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch (321 mm).
d. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
e. Maximum Service Temperature: 178 degrees F (81 degrees C).
f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

G. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Equipment Support and Attachment:
1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

G. Secure fasteners according to manufacturer's recommended torque settings.

H. Remove temporary supports.

END OF SECTION 230529

SECTION 230553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Adhesive-backed duct markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems 2020.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

1.03 SUBMITTALS

A. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Ductwork: pressure sensitive marker.

C. Thermostats: Nameplates.

2.02 NAMEPLATES

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch (40 mm) diameter.

2.04 ADHESIVE-BACKED DUCT MARKERS

A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch (0.76 mm); printed with UV and chemical resistant inks.

B. Style: Individual Label.

C. Color: Yellow/Black.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

B. Prepare surfaces in accordance with Section 099123 for stencil painting.

3.02 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install ductwork with adhesive duct markers. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 230553

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods 2016, with Errata.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008, with Errata (2019).

D. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems 2015, with Errata (2017).

1.03 SUBMITTALS

A. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Procedures for formal deficiency reports, including scope, frequency and distribution.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
   1. Revise TAB plan to reflect actual procedures and submit as part of final report.
   2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
   3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
   4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
   5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

B. Begin final balancing work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Access doors are closed and duct end caps are in place.
   8. Air outlets are installed and connected.
   9. Duct system leakage is minimized.
   10. Hydronic systems are flushed, filled, and vented.
   11. Pumps are rotating correctly.
   12. Proper strainer baskets are clean and in place.
   13. Service and balance valves are open.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

G. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

H. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

I. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

J. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. Plumbing Pumps.
   2. Air Handling Units.
   3. Fans.
   4. Air Filters.
   5. Air Inlets and Outlets.

3.08 MINIMUM DATA TO BE REPORTED

A. Electric Motors:
   1. Manufacturer.
   2. Model/Frame.
   3. HP/BHP.
   4. Phase, voltage, amperage; nameplate, actual, no load.
   5. RPM.
   6. Service factor.
   7. Starter size, rating, heater elements.

8. Sheave Make/Size/Bore.

B. Pumps:
1. Identification/number.
2. Manufacturer.
3. Size/model.
4. Impeller.
5. Service.
6. Design flow rate, pressure drop, BHP.
7. Actual flow rate, pressure drop, BHP.
8. Discharge pressure.
9. Suction pressure.
10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

C. Air Moving Equipment:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Total static pressure (total external), specified and actual.
8. Inlet pressure.
9. Discharge pressure.
10. Fan RPM.

D. Return Air/Outside Air:
1. Identification/location.
2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.

E. Exhaust Fans:
1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

F. Duct Traverses:

END OF SECTION 230593

SECTION 230713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

1.02 RELATED REQUIREMENTS

A. Section 230553 - Identification for HVAC Piping and Equipment.

B. Section 233100 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2021.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 1200 degrees F (649 degrees C).
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E96/E96M.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

D. Indoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 DUCT LINER

A. Note: Choose the liner type - Elastomeric Foam or Glass Fiber.

B. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated Ducts Conveying Air Below Ambient Temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated Ducts Conveying Air Above Ambient Temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Duct and Plenum Liner Application:
   1. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
   2. Seal and smooth joints. Seal and coat transverse joints.
   3. Seal liner surface penetrations with adhesive.
   4. Duct dimensions indicated are net inside dimensions required for air-flow. Increase duct size to allow for insulation thickness.

END OF SECTION 230713

SECTION 230719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

1.02 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2022a.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).

E. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).

F. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service 2022.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.05 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
   2. Maximum Service Temperature: 850 degrees F (454 degrees C).
   3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (0.029 ng/Pa s m).

2.03 FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

A. Insulation: ASTM C553 Type V; flexible, noncombustible.
   1. Comply with ASTM C1695.
   2. K (Ksi) Value: 0.37 at 100 degrees F (0.053 at 38 degrees C), when tested in accordance with ASTM C177 or ASTM C518.
   3. Minimum Service Temperature: 32 degrees F (0 degrees C).
   4. Maximum Service Temperature: 500 degrees F (260 degrees C).
   5. Maximum Water Vapor Absorption: 5.0 percent by weight.
   6. Color: Green.
   7. Weight: 7.65 oz/sq ft (2334.4 g/sq m).
   8. Effective Thickness: 1.25 +/- 0.25 inch (0.032 +/- 0.0064 m).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

E. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.

F. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

END OF SECTION 230719

SECTION 230913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control panels.

B. Control Valves:
   1. Ball valves and actuators.
   2. Globe pattern.
   3. Electronic operators.

C. Dampers.

D. Damper Operators:
   1. Electric operators.

E. Input/Output Sensors:
   1. Temperature sensors.
   2. Static pressure (air pressure) sensors.
   3. Equipment operation (current) sensors.

F. Thermostats:
   1. Electric room thermostats.
   2. Low-limit temperature cutout switch (freezestat).

G. Transmitters:
   1. Building static pressure transmitters.

H. Flow Sensors:
   1. Flow switches.

1.02 RELATED REQUIREMENTS

A. Section 230923 - Direct-Digital Control System for HVAC.

B. Section 232113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.

C. Section 233300 - Air Duct Accessories: Installation of automatic dampers.

D. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

E. Section 262726 - Wiring Devices: Elevation of exposed components.

1.03 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating 2018.

B. ANSI/FCI 70-2 - Control Valve Seat Leakage 2021.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

D. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats 2013.

1.04 SUBMITTALS

A. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

B. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

C. Manufacturer's Instructions: Provide for all manufactured components.

D. Project Record Documents: Record actual locations of control components, including panels, thermostats, and sensors. Accurately record actual location of control components, including panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 WARRANTY

A. Correct defective work within a five year period after Substantial Completion.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.

B. NEMA 250, general purpose utility enclosures with enameled finished face panel.

C. Provide common keying for all panels.

2.03 CONTROL VALVES

A. Ball Valves and Actuators:
   1. Service: Use for brine (30 percent glycol), chilled water, hot water, or steam at 15 to 25 psig (104.4 to 172.4).
   2. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail normally closed (NC).
   3. Replacements in Kind: Provide pressure-independent type.
   4. Rangeability: 500 to 1.
   5. ANSI Rating: Class 150.
   6. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
   7. Body Size:
      a. Under 2-1/2 inches (64 mm):
         1) Connection: NPT.
         2) Materials:
            (a) Body: Brass.
            (b) Flanges: Ductile iron.
            (c) Ball: Chrome-plated brass.
            (d) Stem: Nickel-plated brass.
            (e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
            (f) Stem Seal: EPDM O-Rings.
            (g) Flow Control Disk: Thermoplastic synthetic-resin.
      b. Service Temperature:
         1) Fluid Side: 0 to 284 degrees F (0 to 140 degrees C) liquid or 25 psig (172.4 kPa) steam.
         2) Ambient Side: From minus 4 to 122 degrees F (minus 20 to 50 degrees C).
   8. Actuator Requirements:
      a. Assembly: Factory-mounted.
      b. Input: 0 to 10 VDC configured for proportional control.
      c. Accessories: Provide with valve position indicator and manual override.

B. Globe Pattern:
   1. Up to 2 inches (50 mm): Bronze body, bronze trim, rising stem, renewable composition disc, screwed ends with backseating capacity repackable under pressure.
   2. Hydronic Systems:
      a. Rate for service pressure of 125 psig at 250 degrees F (860 kPa at 121 degrees C).
      b. Replaceable plugs and seats of stainless steel.
      c. Size for 3 psig (20 kPa) maximum pressure drop at design flow rate.
      d. two-way valves shall have equal percentage characteristics, three way valves linear characteristics. Size two-way valve operators to close valves against pump shut off head.

C. Electronic Operators:
   1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
   2. Select operator for full shut off at maximum pump differential pressure.

2.04 DAMPERS

A. Performance: Test in accordance with AMCA 500-D.

B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gauge, 0.1046 inch (2.66 mm).

C. Blades: Galvanized steel, maximum blade size 8 inches (200 mm) wide, 48 inches (1200 mm) long, minimum 22 gauge, 0.0299 inch (0.76 mm), attached to minimum 1/2 inch (13 mm) shafts with set screws.

D. Blade Seals: Synthetic elastomeric, inflatable, mechanically attached, field replaceable.

E. Jamb Seals: Spring stainless steel.

F. Shaft Bearings: Oil impregnated sintered bronze.

G. Linkage Bearings: Oil impregnated sintered bronze.

H. Leakage: Less than one percent based on approach velocity of 2000 ft per min (10 m per sec) and 4 inches wg (1.0 kPa).

I. Maximum Pressure Differential: 6 inches wg (1.5 kPa).

2.05 DAMPER OPERATORS

A. Electric Operators:
   1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

2.06 INPUT/OUTPUT SENSORS

A. Temperature Sensors:
   1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
   2. Construct RTD of nickel or platinum with base resistance of 1000 ohms at 70 degrees F (26 degrees C).
   3. 100 ohm platinum RTD is acceptable if used with project DDC controllers.
   4. Temperature Sensing Device: Compatible with project DDC controllers.
   5. Performance Characteristics:
      a. RTD:
         1) Room Sensor Accuracy: Plus/minus 0.50 degrees F (0.28 degrees C) minimum.
         2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F (0.28 degrees C) minimum.

3) All Other Accuracy: Plus/minus 0.75 degrees F (0.42 degrees C) minimum.

b. Wire Resistance:
   1) Use appropriate wire size to limit temperature offset due to wire resistance to 1.0 degree F (0.56 degrees C) or use temperature transmitter when offset is greater than 1.0 degree F (0.56 degrees C) due to wire resistance.
   2) Compensate for wire resistance in software input definition when feature is available in the DDC controller.

c. Outside Air Sensors: Watertight inlet fitting shielded from direct rays of the sun.

d. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.

e. Room Temperature Sensors with Integral Digital Display:
   1) Construct for wall box.
   2) Provide a four button keypad with the following capabilities:
      (a) Indication of space and outdoor temperatures.
      (b) Manual occupancy override and indication of occupancy status.
      (c) Controller mode status.
      (d) Password enabled setpoint and override modes.

B. Static Pressure (Air Pressure) Sensors:
   1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
   2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F (5 to 40 degrees C).
   3. Output: 0 to 5 vdc with power at 12 to 28 vdc.

2.07 THERMOSTATS

A. Electric Room Thermostats:
   1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
   2. Service: Cooling and heating.

B. Low-Limit Temperature Cutout Switch (low-limit thermostat or freezestat):
   1. Configuration: Digital module tied to sensor-assembly.
   2. Sensing Length: 4 feet (1.2 m).
   3. Setpoint Adjust: Slider.
   4. Switch Type: SPDT, snap-action, form C in dust-protected enclosure.
   5. Sensing Range: 15 to 55 degrees F (minus 9 to 13 degrees C).
   6. Mounting: Locate on cooling coil intake side.
   7. Field Interface: Connect load line-voltage to stater.
   8. Electrical Rating: Pilot duty, 125 VA at 125 to 600 VAC.

2.08 TRANSMITTERS

A. Building Static Pressure Transmitters:
   1. One pipe, direct acting, double bell, scale range 0.01 to 6.0 inch wg (.0025 to 1.5 kPa) positive or negative, and sensitivity of 0.0005 inch wg (0.125 Pa). Transmit electronic signal to receiver with matching scale range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that systems are ready to receive work.

C. Beginning of installation means installer accepts existing conditions.

D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

F. Ensure installation of components is complementary to installation of similar components.

G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches (1200 mm) above floor. Align with lighting switches and humidistats. See Section 262726.

C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

END OF SECTION 230913

SECTION 232300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Check valves.

G. Filter-driers.

H. Exterior penetration accessories.

1.02 RELATED REQUIREMENTS

A. Section 230719 - HVAC Piping Insulation.

B. Section 235400 - Furnaces.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers 2005.

B. AHRI 730 (I-P) - Flow Capacity Rating of Suction Line Filters and Suction Line Filter Driers 2013 (Reapproved 2014).

C. AHRI 750 - Thermostatic Refrigerant Expansion Valves 2007.

D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems 2019, with All Amendments and Errata.

E. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants 2019.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.

G. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes 2018.

H. ASME B31.5 - Refrigeration Piping and Heat Transfer Components 2022.

I. ASME B31.9 - Building Services Piping 2020.

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2022.

K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.

L. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service 2020.

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

N. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2019.

O. ICC (IMC)-2018 - International Mechanical Code 2018.

P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).

Q. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical Current Edition, Including All Revisions.

1.04 SYSTEM DESCRIPTION

A. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

B. Liquid Indicators:
   1. Use line size liquid indicators in main liquid line leaving condenser.
   2. If receiver is provided, install in liquid line leaving receiver.

C. Valves:
   1. Use service valves on suction and discharge of compressors.
   2. Use gauge taps at compressor inlet and outlet.
   3. Use check valves on compressor discharge.
   4. Use check valves on condenser liquid lines on multiple condenser systems.

D. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

E. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.05 SUBMITTALS

A. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.

B. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.

C. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.

D. Test Reports: Indicate results of leak test, acid test.

E. Manufacturer's Installation Instructions: Indicate support, connection requirements, and isolation for servicing.

F. Project Record Documents: Record exact locations of equipment and refrigeration accessories on record drawings.

G. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

2.02 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:
   1. Provide hangers and supports that comply with MSS SP-58.

a. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.
3. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
4. Wall Support for Pipe Sizes to 3 Inches (75 mm): Cast iron hook.
5. Vertical Support: Steel riser clamp.
6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
7. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
8. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.03 REFRIGERANT

A. Refrigerant: R-410A (hydrofluorocarbon) as defined in ASHRAE Std 34.

2.04 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.05 VALVES

A. Diaphragm Packless Valves:
   1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 275 degrees F (135 degrees C).

B. Packed Angle Valves:
   1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 275 degrees F (135 degrees C).

C. Ball Valves:
   1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 300 degrees F (149 degrees C).

D. Service Valves:
   1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi (3450 kPa).

2.06 CHECK VALVES

A. Globe Type:
   1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F (149 degrees C) and maximum working pressure of 425 psi (2930 kPa).

B. Straight Through Type:
   1. Brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psi (3450 kPa) and maximum temperature of 200 degrees F (93 degrees C).

2.07 EXTERIOR PENETRATION ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.5.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (13 mm) space between finished covering and adjacent work.

F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

G. Provide clearance for installation of insulation and access to valves and fittings.

H. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

I. Fully charge completed system with refrigerant after testing.

3.02 FIELD QUALITY CONTROL

A. Test refrigeration system in accordance with ASME B31.5.

B. Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using halide torch. Test to no leakage.

END OF SECTION 232300

SECTION 233100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

B. Duct cleaning.

1.02 RELATED REQUIREMENTS

A. Section 230593 - Testing, Adjusting, and Balancing for HVAC.

B. Section 230713 - Duct Insulation: External insulation and duct liner.

C. Section 233300 - Air Duct Accessories.

D. Section 233700 - Air Outlets and Inlets.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2021.

1.04 SUBMITTALS

A. Product Data: Provide data for duct materials.

1.05 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

B. Ducts: Galvanized steel, unless otherwise indicated.

C. Low Pressure Supply (System with Cooling Coils): 2 inch wg (500 Pa) pressure class, galvanized steel.

D. Return and Relief: 2 inch wg (500 Pa) pressure class, galvanized steel.

E. General Exhaust: 2 inch wg (500 Pa) pressure class, galvanized steel.

2.02 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. VOC Content: Not more than 250 g/L, excluding water.
   3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.03 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil turning vanes of perforated metal with glass fiber insulation.

D. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

C. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

D. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

E. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of air flow.

F. Use double nuts and lock washers on threaded rod supports.

G. At exterior wall louvers, seal duct to louver frame.

3.02 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

END OF SECTION 233100

SECTION 233300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backdraft dampers - metal.

B. Duct access doors.

C. Duct test holes.

D. Volume control dampers.

1.02 RELATED REQUIREMENTS

A. Section 233100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2021.

1.04 SUBMITTALS

A. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS - METAL

A. Gravity Backdraft Dampers, Size 18 by 18 inches (450 by 450 mm) or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.

2.02 DUCT ACCESS DOORS

A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch (25 mm) thick insulation with sheet metal cover.

1. Less Than 12 inches (300 mm) Square: Secure with sash locks.
2. Up to 18 inches (450 mm) Square: Provide two hinges and two sash locks.

2.03 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.04 VOLUME CONTROL DAMPERS

A. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch (200 by 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

1. Blade: 18 gauge, 0.0478 inch (1.21 mm), minimum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 233100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 by 8 inch (200 by 200 mm) size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch (100 by 100 mm) for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

END OF SECTION 233300

SECTION 233416
CENTRIFUGAL HVAC FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backward inclined centrifugal fans.

1.02 RELATED REQUIREMENTS

A. Section 230513 - Common Motor Requirements for HVAC Equipment.

B. Section 230713 - Duct Insulation.

C. Section 233300 - Air Duct Accessories: Backdraft dampers.

D. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program 2015.

B. AMCA 99 - Standards Handbook 2016.

C. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating 2016.

D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans 2014.

E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data 2014.

1.04 SUBMITTALS

A. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

B. Manufacturer's Instructions: Include complete installation instructions.

C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.06 FIELD CONDITIONS

A. Permanent fans may not be used for ventilation during construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS BY FAN TYPE

A. Backward-Inclined Centrifugal Fans:
   1. Refer to schedule on plans for Basis of Design.

2.02 PERFORMANCE REQUIREMENTS

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Comply with AMCA 99.

D. Performance Base: 2370 ft above sea level conditions.

2.03 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION 233416

SECTION 233700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Registers/grilles:
   1. Ceiling-mounted, exhaust and return register/grilles.
   2. Ceiling-mounted, supply register/grilles.
   3. Wall-mounted, supply register/grilles.
   4. Wall-mounted, exhaust and return register/grilles.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

B. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2021.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

D. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2021.

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 CEILING SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, two-way deflection.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting and gasket.

C. Construction: Made of aluminum extrusions with factory enamel finish.

D. Color: As indicated.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.02 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

C. Fabrication: Steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's full range.

E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.03 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing with spring or other device to set blades, horizontal face, double deflection.

B. Fabrication: Steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.

C. Color: To be selected by Architect from manufacturer's standard range.

D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with spring or other device to set blades, horizontal face.

B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: To be selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION 233700

SECTION 235400
FURNACES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Forced air furnaces.

B. Thermostats.

1.02 RELATED REQUIREMENTS

A. Section 230513 - Common Motor Requirements for HVAC Equipment: Additional requirements for fan motors.

B. Section 230713 - Duct Insulation: Duct liner.

C. Section 233100 - HVAC Ducts and Casings.

D. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.03 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators 2021.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2021.

C. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems 2021.

D. UL (DIR) - Online Certifications Directory Current Edition.

1.04 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

B. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

C. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

F. Project Record Documents: Record actual locations of components and connections.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Filters: three for each furnace.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.02 ELECTRIC FURNACES

A. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: Horizontal.
   2. Heating: Electric.

B. Cabinet: Steel with baked enamel finish, easily removed and secured access doors, glass fiber insulation and reflective liner.

C. Supply Fan: Centrifugal type rubber mounted with direct drive motor.

D. Motor:
   1. multiple speed, permanently lubricated, hinge mounted.
   2. Comply with NEMA MG 1.
   3. Refer to Section 230513.

E. Electric Heater: Helix wound bare nichrome wire heating elements arranged in incremental states of 5 kW each, with porcelain insulators.

F. Electric Heater Operating Controls:
   1. Low voltage adjustable room thermostat energized heater stages in sequence with pre-determined delay between heating stages.
   2. High limit temperature control de-energizes heating elements, automatic resets.
   3. Supply fan starts before electric elements are energized and continues operating after thermostat is satisfied until bonnet temperature reaches minimum setting. Include manual switch for continuous fan operation.

G. Air Filters: 1 inch (25 mm) thick glass fiber, disposable type arranged for easy replacement.

H. Performance:
   1. Refer to Furnace Schedule.

2.03 ECONOMIZER DAMPER UNITS

A. Refer to economizer schedule.

2.04 THERMOSTATS

A. Room Thermostat: Low voltage, controlling heating, cooling and fan to maintain temperature setting; with system selector switch (heat-off, cool-off) and fan control switch (auto-off).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.

B. Install in accordance with NFPA 90A.

END OF SECTION 235400

SECTION 236313
AIR COOLED REFRIGERANT CONDENSERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manufactured units.

B. Casing.

C. Condenser coils.

D. Fan requirements.

1.02 RELATED REQUIREMENTS

A. Section 230513 - Common Motor Requirements for HVAC Equipment.

B. Section 232300 - Refrigerant Piping.

C. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment 2023.

B. ASHRAE Std 15 - Safety Standard for Refrigeration Systems 2019, with All Amendments and Errata.

C. ASHRAE Std 20 - Methods of Laboratory Testing Remote Mechanical-Draft Air-Cooled Refrigerant Condensers 2019.

D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide rated capacities, weights, accessories, electrical requirements, and wiring diagrams.

B. Shop Drawings: Indicate components, assembly, dimensions, weights and loading, required clearances, and location and size of field connections. Include schematic layouts showing condenser, refrigeration compressors, cooling coils, refrigerant piping and accessories required for complete system.

C. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.

D. Operation and Maintenance Data: Include start-up instructions, maintenance instructions, parts lists, controls, and accessories.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instruction for rigging, unloading and transporting units.

B. Protect units on site from physical damage. Protect coils.

PART 2 PRODUCTS

2.01 MANUFACTURED UNITS

A. Provide packaged, factory assembled, pre-wired unit, suitable for outdoor use consisting of casing, condensing coil and fans, integral sub-cooling coil liquid accumulator.

B. Construction and Ratings: In accordance with AHRI 210/240 and UL 207. Testing shall be in accordance with ASHRAE Std 20.

C. Performance Ratings: Energy Efficient Rating (EER)/Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1 I-P, in combination with compressor units.

2.02 CASING

A. House components in welded steel frame with steel panels with weather resistant, baked enamel finish.

B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

C. Provide removable access doors or panels with quick fasteners.

2.03 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide sub-cooling circuits. Air test under water to 425 psig (2900 kPa), and vacuum dehydrate. Seal with holding charge of nitrogen.

2.04 FAN REQUIREMENTS

A. Vertical discharge direct driven propeller type condenser fans with fan guard on discharge.

B. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built-in current and thermal overload protection.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide for connection to electrical service. See Section 260583.

C. Provide connection to refrigeration piping system. See Section 232300. Comply with ASHRAE Std 15.

D. Provide cooling season start-up, winter season shut-down service, for first year of operation.

E. Shut-down system if initial start-up and testing takes place in winter and machines are to remain inoperative. Repeat start-up and testing operation at beginning of first cooling season.

END OF SECTION 236313

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Underground feeder and branch-circuit cable.

C. Metal-clad cable.

D. Manufactured wiring systems.

E. Wiring connectors.

F. Electrical tape.

G. Oxide inhibiting compound.

H. Wire pulling lubricant.

I. Cable ties.

J. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

G. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable 2018.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.

I. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.

K. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.

L. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

M. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.

N. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.

O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

P. UL 1569 - Metal-Clad Cables Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.
   1. In addition to other applicable restrictions, may not be used:
      a. Where exposed to damage.
      b. For damp, wet, or corrosive locations.

D. Service entrance cable is not permitted.

E. Armored cable is not permitted.

F. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
      b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
   2. In addition to other applicable restrictions, may not be used:
      a. Where not approved for use by the authority having jurisdiction.
      b. Where exposed to damage.
      c. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
      d. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 260526.

H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

I. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

J. Minimum Conductor Size: 12 AWG.
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
         2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.

K. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:
      a. 240/120 V, 1 Phase, 3 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Neutral/Grounded: White.
      b. Equipment Ground, All Systems: Green.
      c. Isolated Ground, All Systems: Green with yellow stripe.
      d. Travelers for 3-Way and 4-Way Switching: Pink.
      e. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
   1. Copper Building Wire:
      a. Southwire Company: www.southwire.com/#sle.
      b. or equal product.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid.
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 METAL-CLAD CABLE

A. Manufacturers:

1. Southwire Company: www.southwire.com/#sle.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

F. Grounding: Full-size integral equipment grounding conductor.

G. Armor: Steel, interlocked tape.

H. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   6. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.06 ACCESSORIES

A. Electrical Tape:
   1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install metal-clad cable (Type MC) in accordance with NECA 120.

D. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

G. Terminate cables using suitable fittings.
   1. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

H. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

K. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

P. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION 260519

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal air ducts.
8. Provide bonding for metal building frame.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

END OF SECTION 260526

SECTION 260529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.

D. MFMA-4 - Metal Framing Standards Publication 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
      c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.
   2. Channel Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
   4. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch (13 mm) diameter.
      b. Busway Supports: 1/2 inch (13 mm) diameter.
      c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
      d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
      e. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
      f. Outlet Boxes: 1/4 inch (6 mm) diameter.
      g. Luminaires: 1/4 inch (6 mm) diameter.

F. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
   1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
   3. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.
   4. Manufacturers:
      a. RoofTopBlox, or equal.

G. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.
   5. Hollow Stud Walls: Use toggle bolts.
   6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
   7. Sheet Metal: Use sheet metal screws.
   8. Plastic and lead anchors are not permitted.
   9. Hammer-driven anchors and fasteners are not permitted.
   10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
      a. Comply with MFMA-4.
      b. Channel Material: Use galvanized steel.

c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

I. Secure fasteners according to manufacturer's recommended torque settings.

J. Remove temporary supports.

END OF SECTION 260529

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. PVC-coated galvanized steel rigid metal conduit (RMC).

D. Flexible metal conduit (FMC).

E. Liquidtight flexible metal conduit (LFMC).

F. Electrical metallic tubing (EMT).

G. Rigid polyvinyl chloride (PVC) conduit.

H. Conduit fittings.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.

C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit 2018.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.

F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.

G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit 2018.

I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit 2020.

J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing 2021.

K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.

M. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.

N. UL 360 - Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.

O. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.

P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings Current Edition, Including All Revisions.

Q. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

R. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
   4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
   5. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.

D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit or electrical metallic tubing (EMT).

H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

I. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.

J. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

K. Corrosive Locations Above Ground: Use PVC-coated galvanized steel rigid metal conduit, aluminum rigid metal conduit, or reinforced thermosetting resin conduit (RTRC).

L. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet (1.8 m).

M. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.

2.02 CONDUIT REQUIREMENTS

A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).

C. PVC-Coated Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
   4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).

D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.06 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.07 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.08 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

G. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conceal all conduits unless specifically indicated to be exposed.
   4. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   5. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   7. Arrange conduit to maintain adequate headroom, clearances, and access.
   8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
   9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
   10. Route conduits above water and drain piping where possible.
   11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
   12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.

H. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
      a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
   5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
   8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
   9. Use of wire for support of conduits is not permitted.

I. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.

2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

K. Embedment Within Structural Concrete Slabs Not Allowed:

L. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

M. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

N. Provide grounding and bonding in accordance with Section 260526.

3.03 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 260533.13

SECTION 260533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 262726 - Wiring Devices:
   1. Wall plates.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports 2013 (Reaffirmed 2020).

E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

I. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use suitable concrete type boxes where flush-mounted in concrete.
   4. Use suitable masonry type boxes where flush-mounted in masonry walls.
   5. Use raised covers suitable for the type of wall construction and device configuration where required.
   6. Use shallow boxes where required by the type of wall construction.

7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 262726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

E. Install boxes plumb and level.

F. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

G. Install boxes as required to preserve insulation integrity.

H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

I. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

J. Close unused box openings.

K. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

L. Provide grounding and bonding in accordance with Section 260526.

END OF SECTION 260533.16

SECTION 260553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting.

B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Enclosed switches, circuit breakers, and motor controllers:
         1) Identify voltage and phase.
      b. Enclosed Contactors:
         1) Identify ampere rating.
         2) Identify voltage and phase.
   2. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
   3. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
   4. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
      a. Service equipment.
      b. Motor control centers.

B. Identification for Conductors and Cables:
   1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
   2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
   3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:

C. Identification for Raceways:
   1. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet (6.1 m).
      a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
         1) Color Code:

(a) Fire Alarm System: Red.

2) Field-Painting: Comply with Section 099123 and 099113.

3) Vinyl Color Coding Electrical Tape: Comply with Section 260519.

D. Identification for Devices:
1. Use identification label to identify fire alarm system devices.
2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.

E. Identification for Luminaires:
1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
1. Materials:
a. Indoor Clean, Dry Locations: Use plastic nameplates.
b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend:
a. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
a. Equipment Designation: 1/2 inch (13 mm).
5. Color:
a. Normal Power System: White text on black background.

D. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

E. Format for Control Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Load controlled or other designation indicated.

3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

F. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch (3 mm).

F. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

B. Minimum Size:
1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.

C. Legend:
1. Markers for System Identification:

D. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

2.06 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:
1. Materials:
a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Interior Components: Legible from the point of access.
6. Conduits: Legible from the floor.
7. Conductors and Cables: Legible from the point of access.
8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

END OF SECTION 260553

SECTION 260583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices.

E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 262726.

D. Flexible Conduit: As specified in Section 260533.13.

E. Wire and Cable: As specified in Section 260519.

F. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.01 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 260583

SECTION 260923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Time switches.

C. Outdoor photo controls.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 262726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

C. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices 2017.

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

B. Field Quality Control Reports.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

A. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
   a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an

adjustable turn-off delay time interval.

5. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
6. Sensitivity: Field adjustable.
7. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
8. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

B. Ceiling Mounted Occupancy Sensors:
   1. All Ceiling Mounted Occupancy Sensors:
      a. Description: Low profile occupancy sensors designed for ceiling installation.
   2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
      a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
      b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.

C. Power Packs for Low Voltage Occupancy Sensors:
   1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
   2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
   3. Input Supply Voltage: Dual rated for 120/277 V ac.
   4. Load Rating: As required to control the load indicated on drawings.

2.03 OUTDOOR PHOTO CONTROLS

A. Stem-Mounted Outdoor Photo Controls:
   1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
   2. Housing: Weatherproof, impact resistant polycarbonate.
   3. Photo Sensor: Cadmium sulfide.
   4. Provide external sliding shield for field adjustment of light level activation.
   5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
   6. Voltage: As required to control the load indicated on the drawings.
   7. Failure Mode: Fails to the on position.
   8. Load Rating: As required to control the load indicated on the drawings.

2.04 ACCESSORIES

A. Auxiliary Contacts:
   1. Comply with NEMA ICS 5.
   2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

B. Control and Timing Relays:
   1. Comply with NEMA ICS 5.
   2. Provide number and type of relays indicated or required to perform necessary functions.

PART 3 EXECUTION

3.01 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 devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 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.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of lighting control devices provided under this section.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.

G. Provide required supports in accordance with Section 260529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Occupancy Sensor Locations:
   1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
   2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

J. Outdoor Photo Control Locations:
   1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.

K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test outdoor photo controls to verify proper operation, including time delays where applicable.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

D. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

END OF SECTION 260923

SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

E. Floor box service fittings.

F. Access floor boxes.

1.02 RELATED REQUIREMENTS

A. Section 260533.16 - Boxes for Electrical Systems.

B. Section 271000 - Structured Cabling: Voice and data jacks.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2014h, with Amendments (2017).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification) 2014g, with Amendment (2017).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications 2021.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

B. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

C. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.

D. Provide GFCI protection for receptacles serving electric drinking fountains.

E. Unless noted otherwise, do not use combination switch/receptacle devices.

F. For flush floor service fittings, use tile rings for installations in tile floors.

G. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Ivory with ivory nylon wall plate.

C. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

2.03 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

2.04 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

C. GFCI Receptacles:
   1. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
   2. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.05 WALL PLATES

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard.
   3. Screws: Metal with tamper-resistant heads finished to match wall plate finish.

B. Aluminum Wall Plates: Smooth satin finish, clear anodized, factory-coated to inhibit oxidation.

C. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.06 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.

2.07 ACCESS FLOOR BOXES

A. Configuration:
   1. Voice and Data Jacks: As specified in Section 271000.

PART 3 EXECUTION

3.01 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 devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches (1200 mm) above finished floor.
      b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
      c. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

L. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.03 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 262726

SECTION 262813
FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses 2012.

B. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements Current Edition, Including All Revisions.

C. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses Current Edition, Including All Revisions.

D. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses Current Edition, Including All Revisions.

E. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com/#sle.

2.02 APPLICATIONS

A. Service Entrance:
   1. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. Feeders:
   1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.

C. General Purpose Branch Circuits: Class RK1, time-delay.

D. Individual Motor Branch Circuits: Class RK1, time-delay.

E. In-Line Protection for Pole-Mounted Luminaires: Class CC, time-delay.

2.03 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class L Fuses: Comply with UL 248-10.

I. Class CC Fuses: Comply with UL 248-4.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION 262813

SECTION 262816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum) 2013.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

E. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

PART 2 PRODUCTS

2.01 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the

available fault current at the installed location as indicated on the drawings.

2. Minimum Ratings:
   a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
   b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
   c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

N. Heavy Duty Switches:
   1. Comply with NEMA KS 1.
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

O. General Duty Switches:
   1. Conductor Terminations:
      a. Provide mechanical lugs.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

END OF SECTION 262816.16

SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information 2019.

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.

D. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems 2006.

E. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 924 - Emergency Lighting and Power Equipment Current Edition, Including All Revisions.

I. UL 1598 - Luminaires Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. 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.

B. 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 IES LM-63 standard format upon request.

C. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.05 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.06 WARRANTY

A. Provide three year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings or approved equals.

2.02 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. Provide Vandal Resistant Luminaires in spaces open to the public.

H. 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.

2.03 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.

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.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
   1. Self-Powered Exit Signs:
      a. 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.
      b. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
      c. Provide low-voltage disconnect to prevent battery damage from deep discharge.

PART 3 EXECUTION

3.01 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.

3.02 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.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

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.

H. Suspended Luminaires:
1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Emergency Lighting Units:

L. Exit Signs:

M. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 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.

3.06 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.

3.07 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

END OF SECTION 265100

SECTION 265600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Poles and accessories.

1.02 RELATED REQUIREMENTS

A. Section 260529 - Hangers and Supports for Electrical Systems.

B. Section 260533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems 2000 (Reaffirmed 2006).

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1598 - Luminaires Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. 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, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

B. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.07 WARRANTY

A. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 016000 - Product Requirements.

2.02 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, poles, foundations, 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.

PART 3 EXECUTION

3.01 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.

3.02 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.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Pole-Mounted Luminaires:
   1. Foundation-Mounted Poles:
      a. Install foundations plumb.
      b. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      c. Tighten anchor bolt nuts to manufacturer's recommended torque.
   2. Grounding:
      a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   3. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Install lamps in each luminaire.

3.04 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.05 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

B. Just prior to Substantial Completion, replace all lamps that have failed.

END OF SECTION 265600

SECTION 282000
VIDEO SURVEILLANCE

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 281000 - Access Control: For interface with video surveillance system.

E. Section 283111 - Building Intrusion Detection: For interface with video surveillance system.

1.02 REFERENCE STANDARDS

A. 47 CFR 15 - Radio Frequency Devices current edition.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 303 - Standard for Installing and Maintaining Closed-Circuit Television (CCTV) Systems 2019.

D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of cameras with structural members, ductwork, piping, equipment, luminaires, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
   2. Coordinate the work with other installers to provide power for cameras and equipment at required locations.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Video Surveliance System:
   1. Samsung; www.samsung.com/us/

B. Cameras:
   1. Axis Communications: www.axis.com/#sle.
   2. Or approved equal.

2.02 VIDEO SURVEILLANCE SYSTEM

A. Provide modifications and extensions to existing video surveillance system consisting of all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides

the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B, consumer application.

2.03 CAMERAS

A. Provide cameras and associated accessories suitable for operation under the service conditions at the installed location. Provide additional components (e.g. enclosures, heaters, blowers, etc.) as required.

B. Where not factory-installed, provide additional components (e.g. lenses, mounting accessories, etc.) as necessary for complete installation.

C. Camera Enclosures and Mounting Brackets:
   1. Where not factory-installed, provide accessory camera enclosures suitable for operation under the service conditions at the installed location.
   2. Where not factory-installed, provide accessory camera mounting brackets necessary for installation.

2.04 ACCESSORIES

A. Provide components as indicated or as required for connection of video surveillance system to devices and other systems indicated.

B. Provide cables as indicated or as required for connections between system components.
   1. Analog Video Connections:
      a. Coaxial Cables: Copper center conductor and 95 percent bare copper braid shield, minimum RG59/U.
      b. Coaxial Connectors: BNC crimp-on type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings and configurations of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system where applicable.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install video surveillance system in accordance with NECA 1 (general workmanship) and NECA 303.

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment in accordance with Section 260529.

D. Provide grounding and bonding in accordance with Section 260526.

E. Identify system wiring and components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Adjust cameras to provide desired field of view and produce suitable images under all service lighting conditions.

D. Program system parameters according to requirements of Owner.

E. Test for proper interface with other systems.

F. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.06 PROTECTION

A. Protect installed system components from subsequent construction operations.

END OF SECTION 282000

MDT NONDISCRIMINATION AND
DISABILITY ACCOMMODATION NOTICE

Montana Department of Transportation ("MDT") is committed to conducting all of its business in an environment free from discrimination, harassment, and retaliation. In accordance with State and Federal law MDT prohibits any and all discrimination and protections are all inclusive (hereafter "protected classes") by its employees or anyone with whom MDT does business:

Federal protected classes	State protected classes
Race, color, national origin, sex, sexual orientation, gender identity, age, disability, income-level & Limited English Proficiency	Race, color, national origin, parental/marital status, pregnancy, childbirth, or medical conditions related to pregnancy or childbirth, religion/creed, social origin or condition, genetic information, sex, sexual orientation, gender identification or expression, ancestry, age, disability mental or physical, political or religious affiliations or ideas, military service or veteran status, vaccination status or possession of immunity passport

For the duration of this contract/agreement, the PARTY agrees as follows:

(1) Compliance with Regulations: The PARTY (hereinafter includes consultant) will comply with all Acts and Regulations of the United States and the State of Montana relative to Non-Discrimination in Federally and State-assisted programs of the U.S. Department of Transportation and the State of Montana, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.

(2) Non-discrimination:

a. The PARTY, with regard to the work performed by it during the contract, will not discriminate, directly or indirectly, on the grounds of any of the protected classes in the selection and retention of subcontractors, including procurements of materials and leases of equipment, employment, and all other activities being performed under this contract/agreement.
b. The PARTY will provide notice to its employees and the members of the public that it serves that will include the following:
    i. A statement that the PARTY does not discriminate on the grounds of any protected classes.
    ii. A statement that the PARTY will provide employees and members of the public that it serves with reasonable accommodations for any known disability, upon request, pursuant to the Americans with Disabilities Act as Amended (ADA).
    iii. Contact information for the PARTY's representative tasked with handling non-discrimination complaints and providing reasonable accommodations under the ADA.
    iv. Information on how to request information in alternative accessible formats.

c. In accordance with Mont. Code Ann. § 49-3-207, the PARTY will include a provision, in all of its hiring/subcontracting notices, that all hiring/subcontracting will be on the basis of merit and qualifications and that the PARTY does not discriminate on the grounds of any protected class.

(3) Participation by Disadvantaged Business Enterprises (DBEs):

a. If the PARTY receives federal financial assistance as part of this contract/agreement, the PARTY will make all reasonable efforts to utilize DBE firms certified by MDT for its subcontracting services. The list of all currently certified DBE firms is located on the MDT website at mdt.mt.gov/business/contracting/civil/dbe.shtml

b. By signing this agreement, the PARTY assures MDT that:

> *The contractor, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.*

c. The PARTY must include the above assurance in each contract/agreement the PARTY enters.

(4) Solicitation for Subcontracts, Including Procurement of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation, made by the PARTY for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the PARTY of the PARTY's obligation under this contract/agreement and all Acts and Regulations of the United States and the State of Montana related to Non-Discrimination.

(5) Information and Reports: The PARTY will provide all information and reports required by the Acts, Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information and its facilities as may be determined by MDT or relevant US DOT Administration to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the PARTY will so certify to MDT or relevant US DOT Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

(6) Sanctions for Noncompliance: In the event of a PARTY's noncompliance with the Non- discrimination provisions of this contract/agreement, MDT will impose such sanctions as it or the relevant US DOT Administration may determine to be appropriate, including, but not limited to:

a. Withholding payments to the PARTY under the contract/agreement until the PARTY complies; and/or

b. Cancelling, terminating, or suspending the contract/agreement, in whole or in part.

(7) Pertinent Non-Discrimination Authorities: During the performance of this contract/agreement, the PARTY, for itself, its assignees, and successor in interest, agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

Federal

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 CFR Part 21;
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 *et seq.*), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq.*), as amended, (prohibits discrimination on the basis of disability); and 49 CFR Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq.*), (prohibits discrimination on the basis of age);
- Airport and Airways Improvement Act of 1982, (49 U.S.C. § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (broadened the scope, coverage, and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975, and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients, and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act, which prohibits discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Non-Discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which prevents discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of Limited English Proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. § 1681 *et seq.*).

- Executive Order 13672 prohibits discrimination in the civilian federal workforce on the basis of gender identity and in hiring by federal contractors on the basis of both sexual orientation and gender identity.

State

- Mont. Code Ann. § 49-3-205 Governmental services;

- Mont. Code Ann. § 49-3-206 Distribution of governmental funds;

- Mont. Code Ann. § 49-3-207 Nondiscrimination provision in all public contracts.

(8) Incorporation of Provisions: The PARTY will include the provisions of paragraph one through seven in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and/or directives issued pursuant thereto. The PARTY will take action with respect to any subcontract or procurement as MDT or the relevant US DOT Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the PARTY becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the PARTY may request MDT to enter into any litigation to protect the interests of MDT. In addition, the PARTY may request the United States to enter into the litigation to protect the interests of the United States.

STANDARD PROVISIONS INDEX

FEDERAL AID PROJECTS	CONTAINS
Federal Wage Rates (Rev. 1-03-2025)	5 Pages
Fed Montana Building Wage Rates (1-03-2025)	7 Pages
Requirements & Acknowledgement for Working on Railroad R/W	1 Page
Required Contract Provisions Federal-Aid Const. Contracts (FORM FHWA-1273) [Rev.10-23-2023]	14 Pages
Supplemental Revisions for Required Contract Provisions Federal-Aid Const. Contracts (FORM FHWA-1273) [Added 2-4-2016]	1 Page
EEO Affirmative Action Req. on Federal-Aid Construction	1 Page

General Decision Number: MT20250079 01/03/2025

Superseded General Decision Number: MT20240079

State: Montana

Construction Type: Highway

Counties: Montana Statewide

HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30,2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022.	Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022.	Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at https://www.dol.gov/agencies/whd/government-contracts

Modification Number	Publication Date
0	01/03/2025

SUMT2023-001 04/01/2022

	Rates	Fringes
CARPENTER		
Carpenter/Piledriverman	$ 36.05	14.23
Millwright	$ 40.87	14.70
CEMENT MASON/CONCRETE FINISHER	$ 33.41	16.51
DIVER		
Diver Tender	$ 45.30	18.38
Diving	$ 92.66	18.38
Stand-By	$ 46.33	18.38

The tender shall receive 2 hours at the straight time pay rate per shift for dressing and/or undressing when work is done under hyperbaric conditions.

Depth Pay (Surface Diving):
0-20 ft.: Free zone
>20-100 ft.: $2.00 per ft.
>100-150 ft.: $3.00 per ft.
>150-220 ft.: $4 00 per ft.
>220 ft.: $5.00 per ft.

Diving in Enclosures (Diver Only):
0-25 ft.: Free zone
>25-300 ft.: $1.00 per ft.

ELECTRICIAN (LINE CONSTRUCTION)		
Equipment Operator	$ 38.38	18.60
Groundman	$ 29.96	17.64
Lineman	$ 50.11	19.88
ELECTRICIAN		
All Areas	$ 39.08	20.00
IRONWORKER	$ 30.43	25.22
LABORER		
Group 1	$ 27.71	12.36
Group 2	$ 30.87	12.36
Group 3	$ 31.10	12.36
Group 4	$ 32.12	12.36

GROUP 1: Flag Person

GROUP 2: All General Labor work; Burning Bar; Bucket Man; Carpenter Tender; Caisson Worker; Cement Mason Tender; Cement Handler (dry); Chuck Tender; Choker Setter; Concrete Worker; Curb Machine-Lay Down; Crusher and Batch Plant Worker; Fence Erector; Form Setter; Form Stripper; Heater Tender; Landscaper; Pipe Wrapper; Pot Tender; Powderman Tender; Rail and Truck Loaders and Unloaders; Riprapper; Sealants for Concrete and other materials; Sign Erection, Guard Rail and Jersey Rail; Stake Jumper; Spike Driver; Signalman; Tail Hoseman; Tool Checker and Houseman; Traffic Control Worker

GROUP 3: Concrete Vibrator; Dumpman (Grademan); Equipment Handler; Geotextile and Liners; High-Pressure Nozzleman; Jackhammer (Pavement Breaker); Laser Equipment; Non-riding Rollers; Pipelayer; Posthole Digger (power); Power Driven Wheelbarrow; Rigger; Sandblaster; Sod- Cutter-power; Tampers

GROUP 4: Asphalt Raker; Cutting Torch; Grade Setter; High- Scaler; Power Saws (Faller & Concrete); Powderman ($1.00 per hour above Group 4 rate); Rock & Core Drill; Track or Truck Mounted Wagon Drill; Welder including Air Arc

PAINTER	$ 36.00	12.84

POWER EQUIPMENT OPERATOR:		
Group 1	$ 32.47	12.77
Group 2	$ 34.55	12.77
Group 3	$ 35.70	12.77
Group 4	$ 36.67	12.77
Group 5	$ 38.05	12.77
Group 6	$ 39.27	12.77
Group 7	$ 41.95	12.77

GROUP 1: Air Compressor; Auto Fine Graders; Belt Finishing Machine; Boring Machine (small); Cement Silo; Crane, A-Frame Truck Crane; Crusher Conveyor; DW-10, 15, and 20 Tractor Roller; Farm Tractor; Forklift; Form Grader; Front End Loader Under 1 CU Yard; Heavy Duty Drills; Herman Nelson Heater; Mulching Machine; Oiler, All Except Cranes & Shovels; Pumpman

GROUP 2: Air Doctor; Backhoe/Excavator/Shovel to and including 3 CU Yard; Bit Grinder; Bituminous Paving Travel Plant; Boring Machine Large; Broom, Self-Propelled; Concrete Travel Batcher; Concrete Float & Spreader; Concrete Bucket Dispatcher; Concrete Finish Machine; Concrete Conveyor; Distributor; Dozer; Rubber-Tired, Push & Side Boom; Elevating Grader/Gradall; Field Equipment Serviceman; Front End Loader 1 CU Yard to including 5 CU Yard; Grade Setter; Heavy Duty Drills, All Types; Hoist/Tugger, All; Hydralift & Similar; Industrial Locomotive; Motor Patrol, Except Finish; Mountain Skidder; Oiler - Cranes & Shovels; Pavement Breaker, EMSCO; Power Saw, Self-Propelled; Pugmill; Pumpcrete/Grout Machine; Punch Truck; Roller, Other Than Asphalt; Roller, Sheepsfoot, Self-Propelled; Roller, 25 Tons and Over; Ross Carrier; Rotomill Under 6 Ft; Trenching Machine; Washing/Screening Plant

GROUP 3: Asphalt Paving Machine; Asphalt Screed; Backhoe/Excavator/Shovel Over 3 CU Yard; Cableway Highline; Concrete Batch Plant; Concrete Curing Machine; Concrete Pump; Cranes; Creter; Cranes, Electric Overhead; Cranes 24 Tons and Under; Curb Machine/Slip Form Paver; Finish Dozer; Front End Loader Over 5 CU Yard; Mechanic/Welder; Pioneer Dozer; Roller Asphalt (Breakdown & Finish); Rotomill, Over 6 FT; Scraper, Single, Twin or Pulling Belly Dump; Yo-Yo Cat

GROUP 4: Asphalt/Hot Plant Operator, Cranes, 25 Tons to 44 Tons; Crusher Operator; Finish Motor Patrol; Finish Scraper

GROUP 5: Cranes, 45 Tons To Including 74 Tons

GROUP 6: Cranes, 75 Tons To Including 149 Tons; Crane, Whirley (All)

GROUP 7: Cranes, 150 Tons To Including 250 Tons (Add $ 1.00 For Every 100 Tons Over 250 Tons; Crane, Tower (All)

TRUCK DRIVER

Group 1	$ 28.21	12.57
Group 2	$ 35.74	12.57

GROUP 1: Pilot Car

GROUP 2: Combination Truck and Concrete Mixer and Transit Mixer; Dry Batch Trucks; Distributor Driver; Dumpman; Dump Trucks and Similar Equipment; Dumpster; Flat Trucks; Lumber Carriers; Lowboys; Pickup; Powder Truck Driver; Power Boom; Serviceman; Service Truck/Fuel Truck/ Tireperson; Truck Mechanic; Trucks With Power Equipment; Warehouseman, Partsman, Cardex and Warehouse Expeditor; Water Trucks

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at

https://www.dol.gov/agencies/whd/government-contracts

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", “”SA””, or “”SC”” denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers.0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

“”SU”” wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA

reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the “”SA”” identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

Has there been an initial decision in the matter? This can be:

*a survey underlying a wage determination
*an existing published wage determination
*an initial WHD letter setting forth a position on a wage determination matter
*an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

General Decision Number: MT20250029 01/03/2025

Superseded General Decision Number: MT20240029

State: Montana

Construction Type: Building

County: Dawson County in Montana.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30,2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022.	Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022.	Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025

ASBE0082-002 08/01/2024

	Rates	Fringes
HEAT and FROST INSULATOR	$ 43.81	21.87

BOIL0011-002 01/01/2021

	Rates	Fringes
BOILERMAKER	$ 34.12	30.94

BRMT0010-001 06/01/2020

	Rates	Fringes
BRICKLAYER	$ 30.55	15.75

CARP0082-012 06/01/2024

	Rates	Fringes
CARPENTER (Form Work Only)	$ 30.24	14.33

Zone Definition:
The hourly rate applicable to each project is determined by measuring the road miles over the shortest practical route from the County Courthouse of the following towns to the center of the job: Billings, Bozeman, Butte, Great Falls, Helena, Kalispell, Lewiston, Miles City, and Missoula

Zone 1: 0 to 30 miles - Base Rate
Zone 2: 31 to 60 miles - $4.00
Zone 3: over 60 miles - $6.00

CARP1607-007 06/01/2024

	Rates	Fringes
MILLWRIGHT	$ 45.26	30.17

Zone Definition:
The hourly rate applicable to each project is determined by measuring the road miles over the shortest practical route from the County Courthouse of the following towns to the center of the job: Billings, Bozeman, Butte, Great Falls, Helena, Kalispell, Lewiston, Miles City, and Missoula

Zone 1: 0 to 30 miles - Base Rate
Zone 2: 31 to 60 miles - $4.00
Zone 3: over 60 miles - $6.00

ELEC0532-006 06/01/2024

	Rates	Fringes
ELECTRICIAN	$ 41.92	5.5%+15.19

ELEV0019-005 01/01/2023

	Rates	Fringes
ELEVATOR MECHANIC	$ 62.25	37.335+a+b

FOOTNOTE:
a. Employer contributes 8% of the basic hourly rate for over 5 years' service and 6% of the basic hourly rate for 6 months to 5 years of service as vacation paid credit.
b. Eight paid holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Veteran's Day; Thanksgiving Day; Friday after Thanksgiving and Christmas Day

ENGI0400-003 05/01/2013

	Rates	Fringes
POWER EQUIPMENT OPERATOR:		
(1) A-frame truck Crane	$ 24.32	11.40
(4) Cranes 25-44 tons	$ 27.00	11.40
(5) Cranes 45-74 tons	$ 28.00	11.40
(6) Cranes 75 to 144 tons, whirley cranes	$ 29.00	11.40
(7) Cranes, 150 tons to including 250 tons (add $1.00 for every 100 tons over 250 tons) Crane, Tower (all)	$ 30.00	11.40

Zone Definitions for Power Equipment Operators:
The zone hourly rates applicable to each project shall be determined by measuring the road miles over the shortest practical maintained route from the nearest County Court House of the following listed towns to the center of the job:

BILLINGS, BOZEMAN, BUTTE, GREAT FALLS, HELENA, KALISPELL, MISSOULA

Zone 1: 0 to 30 miles - Base Pay
Zone 2: 30 to 60 miles - Base Pay + $3.50
Zone 3: Over 60 miles - Base Pay + $5.50

IRON0732-014 06/01/2024

	Rates	Fringes
IRONWORKER, REINFORCING	$ 36.83	25.30

PLUM0030-011 09/01/2024

	Rates	Fringes
PLUMBER, Excludes HVAC Pipe Installation	$ 41.00	20.47

SHEE0103-009 06/01/2022

	Rates	Fringes
SHEET METAL WORKER (HVAC Duct Installation Only)	$ 33.00	20.17

SUMT2011-005 01/04/2011

	Rates	Fringes
CARPENTER (Drywall Hanging Only)	$ 22.69	0.00
CARPENTER, Excludes Drywall Hanging, and Form Work	$ 16.70 **	2.31
CEMENT MASON/CONCRETE FINISHER	$ 18.27	1.50
IRONWORKER, STRUCTURAL	$ 20.45	12.76
LABORER: Common or General	$ 14.47 **	3.11
LABORER: Mason Tender - Brick.	$ 18.37	5.94
OPERATOR: Excavator	$ 22.98	5.57
OPERATOR: Forklift	$ 21.44	8.05
PAINTER: Brush, Roller and Spray	$ 19.18	0.00
PIPEFITTER, Excludes HVAC Pipe Installation	$ 29.34	12.95
PLUMBER (HVAC Pipe Installation)	$ 25.75	10.87
ROOFER	$ 17.36 **	3.83
TRUCK DRIVER: Dump Truck	$ 18.88	4.66

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.75) or 13658 ($13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies To all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the

contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care: to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union who's collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey

data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:
- a) a survey underlying a wage determination
- b) an existing published wage determination
- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be Directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION

"CONTRACTOR REQUIREMENTS AND ACKNOWLEDGMENT FOR WORKING ON RAILROAD RIGHT-OF-WAY"

This document must be dated and signed by the Contractor and submitted to the State before occupying or working on Railroad right-of-way.

1) No change, which has a direct effect on the Railroad, will be made to construction plans without submitting revised plans and receiving approval from the Railroad. Work covered by the plans, that requires flagging, will be covered by the Railroad/Highway Agreement. For work that is a result of the contractor's discretion, flagging protection will be required when equipment crosses or is working within 25 feet (7.62 meters) of center of any live track. When deemed necessary by local Railroad officers, a flagman may be required at all times while working on Railroad right-of-way in high density rail traffic area.

2) Crossing of any Railroad tracks must be done at approved locations and must be full depth timber, rubber, etc. Any equipment with steel wheels, lugs or tracks must not cross steel rails without the use of rubber tires or other approved protection. This shall apply specifically to, but not be limited to, access for Contractor furnished gravel, borrow or waste sites. The Contractor will be required to obtain a permit from the Railroad, and comply with any provisions thereof, before using any private Railroad crossings. All track crossing locations must be covered by a Private Roadway and Crossing Agreement. This does not apply to any public crossing.

3) Costs of flagging or planking protection of the tracks, which are a direct result of the planned construction, will be paid for by the State. Costs of flagging, planking for protection of the tracks, installation of new crossings or other work caused by the Contractor's discretion, will be paid by the Contractor.

4) When work to be performed by the Contractor is not covered in the Railroad/Highway agreement, the Contractor must furnish a plan to the Railroad for approval showing details as to how any work that may affect the Railroad will be accomplished.

5) Storing of construction materials or any other material, including dirt, sand, etc., within the Railroad right-of-way, will not be allowed unless covered by an easement, construction permit, or Contractor's permit/lease.

6) Construction within 25 feet (7.62 meters) of the center of any track not covered by the Railroad/Highway agreement will require plan approval and authorization by the Railroad Superintendent Maintenance and Engineering. This includes, but is not limited to, any excavation, slope work and driving of sheet piling.

7) No vehicles, equipment or machines shall be parked or stored unattended within 25 feet (7.62 meters) of any track, on railroad right-of-way, without specific written approval of the Railroad.

8) When any work is to be performed on Railroad property by the Contractor that is not shown in the construction plans, the Contractor must submit a detailed plan of the work to the Railroad for their approval.

CONTRACTOR'S ACKNOWLEDGMENT:

_____
Company

By: _____
Name

_____
Title

_____
Date

WORK SITE LOCATION:

_____
Town

_____
State

_____
Project #

Rev. 01/01/04

FHWA-1273 – Revised October 23, 2023

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. General
II. Nondiscrimination
III. Non-segregated Facilities
IV. Davis-Bacon and Related Act Provisions
V. Contract Work Hours and Safety Standards Act Provisions
VI. Subletting or Assigning the Contract
VII. Safety: Accident Prevention
VIII. False Statements Concerning Highway Projects
IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
XI. Certification Regarding Use of Contract Funds for Lobbying
XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of $10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding $10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (*see* 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action

within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:
(1) Withholding monthly progress payments;
(2) Assessing sanctions;
(3) Liquidated damages; and/or
(4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on Form FHWA-1391. The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than $10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding $2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 “Contract provisions and related matters” with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. *Wage rates and fringe benefits.* All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in paragraphs (d) and (e) of 29 CFR 5.5, the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act (40 U.S.C. 3141(2)(B)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.e. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in paragraph 4. of this section. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph 1.c. of this section) and the Davis-Bacon poster (WH–1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. *Frequently recurring classifications.* (1) In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in 29 CFR part 1, a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to paragraph 1.c. of this section, provided that:

(i) The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

(ii) The classification is used in the area by the construction industry; and

(iii) The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

(2) The Administrator will establish wage rates for such classifications in accordance with paragraph 1.c.(1)(iii) of this section. Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

c. *Conformance.* (1) The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is used in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

(3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to *DBAconformance@dol.gov*. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

(4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to *DBAconformance@dol.gov*, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30–day period that additional time is necessary.

(5) The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division under paragraphs 1.c.(3) and (4) of this section. The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 1.c.(3) or (4) of this section must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

d. *Fringe benefits not expressed as an hourly rate.* Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

e. *Unfunded plans.* If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided,* That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in § 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

f. *Interest.* In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. Withholding (29 CFR 5.5)

a. *Withholding requirements.* The contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in this section for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in paragraph 3.d. of this section, the contracting agency may on its own initiative and after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with paragraph

2.a. of this section or Section V, paragraph 3.a., or both, over claims to those funds by:

(1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;

(2) A contracting agency for its reprocurement costs;

(3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;

(4) A contractor's assignee(s);

(5) A contractor's successor(s); or

(6) A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901–3907.

3. Records and certified payrolls (29 CFR 5.5)

a. *Basic record requirements* (1) *Length of record retention.* All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

(2) *Information required.* Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

(3) *Additional records relating to fringe benefits.* Whenever the Secretary of Labor has found under paragraph 1.e. of this section that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in 40 U.S.C. 3141(2)(B) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(4) *Additional records relating to apprenticeship.* Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

b. *Certified payroll requirements* (1) *Frequency and method of submission.* The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to the contracting agency. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system.

(2) *Information required.* The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under paragraph 3.a.(2) of this section, except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (*e.g.,* the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH–347 or in any other format desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division website at *https://www.dol.gov/sites/dolgov/files/WHD/legacy/files/wh347/.pdf* or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the contracting agency.

(3) *Statement of Compliance.* Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

(i) That the certified payroll for the payroll period contains the information required to be provided under paragraph 3.b. of this section, the appropriate information and basic records are being maintained under paragraph 3.a. of this section, and such information and records are correct and complete;

(ii) That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

(4) *Use of Optional Form WH–347.* The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 will satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(3) of this section.

(5) *Signature.* The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

(6) *Falsification.* The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under 18 U.S.C. 1001 and 31 U.S.C. 3729.

(7) *Length of certified payroll retention.* The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

c. *Contracts, subcontracts, and related documents.* The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

d. *Required disclosures and access* (1) *Required record disclosures and access to workers.* The contractor or subcontractor must make the records required under paragraphs 3.a. through 3.c. of this section, and any other documents that the contracting agency, the State DOT, the FHWA, or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by § 5.1, available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

(2) *Sanctions for non-compliance with records and worker access requirements.* If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to § 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under 29 CFR part 6 any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

(3) *Required information disclosures.* Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address of each covered worker, and must provide them upon request to the contracting agency, the State DOT, the FHWA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity (29 CFR 5.5)

a. *Apprentices* (1) *Rate of pay.* Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) *Fringe benefits.* Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

(3) *Apprenticeship ratio.* The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to paragraph 4.a.(4) of this section. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph 4.a.(1) of this section, must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(4) *Reciprocity of ratios and wage rates.* Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

b. *Equal employment opportunity.* The use of apprentices and journeyworkers under this part must be in conformity with

the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

c. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeyworkers shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor must insert FHWA-1273 in any subcontracts, along with the applicable wage determination(s) and such other clauses or contract modifications as the contracting agency may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate. 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility. a. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of 40 U.S.C. 3144(b) or § 5.12(a).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of 40 U.S.C. 3144(b) or § 5.12(a).

c. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, 18 U.S.C. 1001.

11. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, this part, or 29 CFR part 1 or 3;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, this part, or 29 CFR part 1 or 3;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, this part, or 29 CFR part 1 or 3; or

d. Informing any other person about their rights under the DBA, Related Acts, this part, or 29 CFR part 1 or 3.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchpersons and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1. of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or

mechanic, including watchpersons and guards, employed in violation of the clause set forth in paragraph 1. of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1. of this section.

* $31 as of January 15, 2023 (See 88 FR 88 FR 2210) as may be adjusted annually by the Department of Labor, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

3. Withholding for unpaid wages and liquidated damages

a. *Withholding process.* The FHWA or the contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in this section on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with Section IV paragraph 2.a. or paragraph 3.a. of this section, or both, over claims to those funds by:

(1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;

(2) A contracting agency for its reprocurement costs;

(3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;

(4) A contractor's assignee(s);

(5) A contractor's successor(s); or

(6) A claim asserted under the Prompt Payment Act, 31 U.S.C. 3901–3907.

4. Subcontracts. The contractor or subcontractor must insert in any subcontracts the clauses set forth in paragraphs 1. through 5. of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1. through 5. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in this part;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or this part;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or this part; or

d. Informing any other person about their rights under CWHSSA or this part.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term “perform work with its own organization” in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of $150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.327.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.327.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost $25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1**. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. “First Tier Covered Transactions” refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (https://www.sam.gov/). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;.

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, 2 CFR 180.800;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

* * * * *

3. **Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost $25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. “First Tier Covered Transactions” refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated. 2 CFR 1200.220 and 1200.332.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the $25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (https://www.sam.gov/), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily

excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment. 2 CFR 180.325.

* * * * *

4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(1) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(2) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(3) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

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XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed $100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed $100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B)
This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

Supplemental Revisions for FHWA Form-1273 (Dated May 1, 2012)
Required Contract Provisions
Federal-Aid Construction Contracts

The following are supplementary or amendatory to the May 1, 2012, FHWA Form-1273 insofar as they apply to this contract:

Add the following provisions in accordance with the FHWA memo dated December 11, 2015:

Utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

Furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in above paragraph to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

SPECIAL PROVISIONS

EEO AFFIRMATIVE ACTION REQUIREMENTS ON FEDERAL & FEDERAL-AID CONSTRUCTION CONTRACTS

Federal-aid contractors are hereby notified they are subject to the OFCCP goals and economic areas for minority and female participation expressed below. Compliance with the goals and OFCCP affirmative action efforts for contracts and subcontracts consisting of $10,000 or more will be determined by OFCCP officials.

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Offeror's or Bidder's attention is called to the Equal Opportunity Clause and "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

GOALS FOR FEMALE PARTICIPATION (statewide) 6.9%

GOALS FOR MINORITY PARTICIPATION IN EACH TRADE
Economic Areas:

152
Non-SMSA (Standard Metropolitan Statistical Area) Counties 4.4%
Daniels, Richland, Roosevelt, Sheridan

153 Great Falls, MT
SMSA Counties
3040 Great Falls, MT 3.2%
Cascade

Non-SMSA Counties 4.1%
Blaine, Broadwater, Chouteau, Fergus, Glacier, Hill, Jefferson, Judith Basin, Lewis & Clark, Liberty, Meagher, Petroleum, Phillips, Pondera, Teton, Toole, Valley, Wheatland

154 Missoula, MT
Non-SMSA Counties 2.7%
Beaverhead, Deer Lodge, Flathead, Granite, Lake, Lincoln, Madison, Mineral, Missoula, Powell, Ravalli, Sanders, Silver Bow

155 Billings, MT
SMSA Counties
0880 Billings, MT 3.3%
Yellowstone

Non-SMSA Counties 3.3%
Big Horn, Carbon, Carter, Custer, Dawson, Fallon, Gallatin, Garfield, Golden Valley, McCone, Musselshell, Park, Powder River, Prairie, Rosebud, Stillwater, Sweet Grass, Treasure, Wibaux, Yellowstone Nat'l Park

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.