

Solicitation: 1284N819R0001

Project: Flaming Gorge Ranger District Office Addition

Location: Flaming Gorge Ranger District – Ashley National Forest

Attachment: J-2 Specifications

Section C - Description/Specifications/Statement of Work
GENERAL SPECIFICATIONS
FLAMING GORGE RANGER DISTRICT OFFICE REMODEL
(Final – 11/16/2018)

1.1 SCOPE OF CONTRACT

- A. This project consists of constructing an office addition of approximately 3225 square feet to the existing Flaming Gorge Ranger District office. The facility is located in Manila, Utah on property owned by the Ashley National Forest. The project includes some site demolition, disposal and preparation for new construction. There is minor selective building demolition of a concrete stair, railing and siding on the existing building. The contract includes the construction of an addition to the west that will be connected by a breezeway and planter between the existing building and building addition. The additional office space houses a new conference room, break area, open office areas, two single offices, hallways, bathrooms, mechanical room, and telecom room. The project includes installation of HVAC systems, toilets, urinal, drinking fountain, sinks, lavatories piping, electrical panels, wiring, lighting, outlets, and telecommunications. Exterior work includes the construction of a new concrete entry, landscaping, irrigation, and exterior site elements as shown in the drawings and specifications.
- B. The project includes the following base bid items and bid option items as shown in the Schedule of Items:
1. Base Bid:
 - a. Mobilization and Bond
 - b. District Office Addition: Lump Sum, but include a Schedule of Values for the bid
(Items further described under specification Section 000501: All building addition work within 10' of perimeter)
 - 1) Division 1: General Requirements
 - 2) Division 2: Existing Conditions
 - 3) Division 3: Concrete
 - 4) Division 5: Metals
 - 5) Division 6: Wood and Plastics and Composites
 - 6) Division 7: Thermal and Moisture Protection
 - 7) Division 8: Openings
 - 8) Division 9: Finishes
 - 9) Division 10: Specialties
 - 10) Division 11 and 12: Equipment and Furnishings
 - 11) Division 22: Plumbing
 - 12) Division 23: Heating Ventilation and Air conditioning
 - 13) Division 26, 27, 28: Electrical, Communications and Security
 - 14) Divisions 31,32: Earthwork and Exterior Improvements
 - c. Steel planter boxes
Electrical service and feeder to Panel D
 - d. Electrical Parking Lot Lighting and Damaged Com Cable
 2. Bid Option – A:
 - a. Site Furnishings (picnic tables) (2)
 - b. Site Furnishings (bike rack)

- c. Landscape Irrigation system
 - d. Exterior Plants, Boulder Placement, Planting media
 - e. Landscape stone, weed barrier, steel edging
3. Bid Option – B
- a. (Civil)Asphalt Parking Lot
 - b. Concrete sidewalk, hardscape, curb, gutter

1.2 PROJECT LOCATION

- A. The Project Site is located on USDA Forest Service property at the address of 25 West Hwy 43, Manila, UT 84046. Located in Daggett County.

1.3 SITE INFORMATION AND LIMITATIONS

- A. The following site conditions are considered incidental to the contract and the contractor will not be paid directly for any of the following items:
 - 1. The areas of the office building shall remain open during the construction. The contractor shall be responsible for constructing a temporary barrier between the areas of the building to remain and the new construction. The Contractor will be responsible for signing and limiting public access to construction areas.
 - 2. The Contractor shall not disrupt existing utility service (water, power, telecom, sewer, etc.) to and within the existing building without coordination and approval from the Contracting Officer's Representative.
 - 3. Water is available at the site for construction purposes.
 - 4. Electrical power is available at the site for construction purposes. The Contractor will be responsible for coordinating modifications to existing power to allow for his use.
 - 5. Other utilities are not available at the site for construction purposes.
 - 6. The Contractor shall provide temporary toilet facilities (porta-potty) at the site during all construction work. Toilet facilities shall be provided at a rate of one stool for every 10 workers assigned or working on site with a minimum of one required. The contractor will not be allowed to utilize the toilet facilities available within the government facilities.

1.4 TRAFFIC CONTROL AND CONSTRUCTION SIGNING

- A. No work that endangers, interferes, or conflicts with traffic or access to work sites shall be performed until a plan for satisfactory warning and handling of traffic has been submitted by the contractor and approved by the CO and Local Transportation Authority. Construction signing for traffic control shall conform to the Manual of Uniform Traffic Control Devices (MUTCD). All traffic control signs will be placed in areas adequate for a truck pulling a fifth wheel trailer to be turned around. Contractor shall not be paid directly for this item, rather it will be considered incidental to other items of work listed in the Schedule of Items.
- B. Signing and barricades shall be adequate enough to protect Forest Service employees and public during all phases of construction.

1.5 WORK CAMPS, STAGING AND STORAGE AREAS

- A. Areas for staging operations and storage of materials shall be approved by the CO. The Contractor must request in writing for approval from the CO to stage trailers (work or housing) on site. Overnight camping on site will not be allowed.
- B. Confine storage of materials and equipment as approved by the Contracting Officer.
- C. Contractor shall maintain access to the facilities for Forest Service contracting personnel.

1.6 INSPECTION OF WORKSITE

- A. The contractor acknowledges they have taken the necessary steps to ascertain the nature and location of work, and have investigated and satisfied themselves as to the general and local conditions that can affect

the work or its cost. Any failure of the contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from the responsibility of estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expenses to the government.

1.7 START DATE

- A. April 2019

1.8 CONTRACT TIME

- A. 270 Calendar Days

1.9 SPECIFICATIONS

- A. The following specifications are attached. Some sections in the schedule of items refer to other sections not listed and are subsidiary to, or are included in payment for other pay items in this contract. These items are considered incidental and no additional compensation will be made.

Section 000501 - District Office Addition
Section 010250 - Construction Staking
Section 011250 - Measurement And Payment With Asphalt
Section 011900 - Mobilization
Section 013300 - Submittal Procedures
Section 014100 - Quality Control
Section 023701 - Sediment And Erosion Control Measures
Section 024100 - Waste Material Disposal
Section 033000 - Cast-In-Place Concrete
Section 033510 - Polished Concrete Finishing
Section 033545 - Concrete Sidewalks And Curb & Gutters
Section 051200 - Structural Steel Framing
Section 055000- Metal Fabrications
Section 061000 - Rough Carpentry
Section 061500 – Tongue and Groove Wood Ceiling and Soffits
Section 061600 - Sheathing
Section 064023 - Interior Architectural Woodwork
Section 071113 - Bituminous Dampproofing
Section 072100 - Thermal Insulation
Section 074113.16 - Standing-Seam Metal Roof Panels
Section 074213.13 - Metall Wall Panels
Section 074570 - Cementitious Panels
Section 076200 - Sheet Metal Flashing And Trim
Section 079200 - Joint Sealants
Section 081111 – Hollow Metal Frames
Section 081416 - Flush Wood Doors
Section 082143 - Out-Swing Entry Doors
Section 083113 - Access Doors And Frames
Section 084113 – Aluminum Storefront
Section 085200 - Aluminum Clad Wood Windows
Section 087100 - Door Hardware
Section 088000 - Glazing
Section 092900 - Gypsum Board
Section 093000 - Tiling
Section 096810 - Carpet Tile
Section 096400- Wood Flooring
Section 096513- Resilient Base and Accessories
Section 097700 - Special Wall Finishes

Section 099120 - Painting
 Section 099300 - Staining And Transparent Finishing
 Section 099600 - High-Performance Coatings
 Section 101400 - Exterior Signs
 Section 101401 - Building Interior Signage
 Section 101550 - Toilet Compartments
 Section 102239 - Folding Panel Partitions
 Section 102800 - Toilet And Bath Accessories
 Section 105201 - Fire-Protection Specialties
 Section 113100 - Appliances
 Section 122113 - Roller Window Shades
 Section 124813 - Entrance Floor Mats And Frames
 Section 129300 - Site Furnishings
 Section 220517 - Sleeves And Sleeve Seals For Plumbing Piping
 Section 220519 - Meters And Gages For Plumbing Piping
 Section 220529 - Hangers And Supports For Plumbing Piping And Equipment
 Section 220553 - Identification For Plumbing Piping And Equipment
 Section 220719 - Plumbing Piping Insulation
 Section 221100 - Water Distribution Systems
 Section 221102 - Curb Valves And Boxes
 Section 221116 - Domestic Water Piping
 Section 221119 - Domestic Water Piping Specialties
 Section 221123 - Domestic Water Pumps
 Section 221300 - Onsite Wastewater Treatment Systems
 Section 221316 - Sanitary Waste And Vent Piping
 Section 221319 - Sanitary Waste Piping Specialties
 Section 223400 - Fuel-Fired, Domestic-Water Heaters
 Section 224100 - Residential Plumbing Fixtures
 Section 224213.13 - Commercial Water Closets
 Section 224213.16 - Commercial Urinals
 Section 224216.13 - Commercial Lavatories
 Section 224216.16 - Commercial Sinks
 Section 224716 - Pressure Water Coolers
 Section 230517 - Sleeves And Sleeve Seals For Hvac Piping
 Section 230519 - Meters And Gages For Hvac Piping
 Section 230529 - Hangers And Supports For Hvac Piping And Equipment
 Section 230548 - Vibration And Seismic Controls For Hvac
 Section 230553 - Identification For Hvac Piping And Equipment
 Section 230593 - Testing, Adjusting, And Balancing For Hvac
 Section 230713 - Duct Insulation
 Section 230719 - Hvac Piping Insulation
 Section 231126 - Facility Liquefied-Petroleum Gas Piping
 Section 232300 - Refrigerant Piping
 Section 233113 - Metal Ducts
 Section 233300 - Air Duct Accessories
 Section 233713.13 - Air Diffusers
 Section 233713.23 - Air Registers And Grilles
 Section 235416.13 - Gas-Fired Furnaces
 Section 236313 - Air-Cooled Refrigerant Condensers
 Section 238216.13 - Refrigerant Air Coils
 Section 260500 - Common Work Results For Electrical
 Section 260519 - Low-Voltage Electrical Power Conductors And Cables
 Section 260526 - Grounding And Bonding For Electrical Systems
 Section 260533 - Raceways And Boxes For Electrical Systems
 Section 260553 - Identification For Electrical Systems
 Section 260923 - Lighting Control Devices

Section 262726 - Wiring Devices
Section 265100 - Lighting
Section 270500 - Common Work Results For Communications
Section 270526 - Grounding And Bonding For Communications Systems
Section 270528 - Pathways For Communications Systems
Section 270536 - Cable Trays For Communications Systems
Section 271100 - Communications Equipment Room Fittings
Section 271200 - Communications Copper Network Cabling
Section 311000 - Clearing And Grubbing
Section 312000 - Earthwork
Section 312010 - Select Borrow
Section 312100 - Project Site Preparation And Grading
Section 312225 - Excavation & Embankment
Section 321200 - Hot-Mix Asphalt Paving
Section 321204 - Crushed Aggregate Base Or Surface Course
Section 322640 - Pavement Marking
Section 322705 - Pavement Sawing
Section 328000 - Irrigation System
Section 329220 - Drainage Structure
Section 329310 - Exterior Plants, Landscape Boulders And Topsoil
Section 329400 - Landscape Stone, Wood Mulch, Weed Barrier & Landscape Edging

END OF SECTION C
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 000501 - DISTRICT OFFICE ADDITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This work includes the construction of the District Office Building Addition

1.2 REFERENCE SPECIFICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- 2015 International Building Code
 - 2015 International Residential Code
 - 2015 International Plumbing Code
 - 2015 International Mechanical Code
 - 2015 International Fuel Gas Code
 - 2015 International Energy Conservation Code
 - 2015 International Urban-Wildland Interface Code
 - 2017 National Electrical Code
 - 2013 National Fire Protection Association Standards 13R and 13D.
 - 2004 Americans with Disabilities Act/Architectural Barriers Act Guidelines (ADA/ABAG)
(<http://www.access-board.gov/adaag/html/adaag.htm>)

1.3 MEASUREMENT AND PAYMENT

- A. DISTRICT OFFICE ADDITION - Measurement and Payment shall be Lump Sum Quantity (LSQ) as shown in the Schedule of Items for the addition constructed and completed ready for use. Measurement shall include all work items within 10 feet of the foundation line (including utilities within those limits). This pay item does not include the additional items listed in other bid items. Payment shall include the entrance concrete landings shown on plans and the planter attached to and next to the building connection. Payment shall include perimeter drainage rock. Payment shall include the full mechanical system outside the 10 feet.
- B. **Schedule of Values.** The Contractor shall submit to the Government **with the bid** an initial Schedule of Values for the Work, allocating values as the contractor understands the work among all categories or portions of the Work to provide a complete and functional facility. The contractor shall include all work within 10' of the building foundation perimeter. The Schedule of Values shall be prepared in such form and supported by data to substantiate its accuracy to the extent as the Government may require, and shall be based upon the latest cost information available to Contractor.

1. The Lump sum bid shall be broken out by CSI Specification Divisions as follows:

- a. Division 01: General Conditions
- b. Division 02: Existing Conditions
- c. Division 03: Concrete
- d. Division 05: Metals
- e. Division 06: Wood, Plastics and Composites
- f. Division 07: Thermal and Moisture Protection
- g. Division 08: Openings
- h. Division 09: Finishes
- i. Division 10: Specialties
- j. Division 11 and 12: Equipment and Furnishings
- k. Division 22: Plumbing
- l. Division 23: Heating, Ventilation and Air Conditioning

- m. Division 26, 27, 28: Electrical, Communications and Security
 - n. Division 31 and 32: Earthwork and Exterior Improvements
 - 2. By way of example and not by limitation, the Schedule of Values should include and delineate: the installation costs for all procured materials and equipment, so that logical and realistic cost breakdowns are established and set forth for all facilities, phases, areas, trade disciplines, utility and electrical systems and major components thereof. If large discrepancies exist between the bid and the Government estimate, further detail will be required for negotiation. The Government accepted Schedule of Values shall be used as a basis for the Contractors Applications for Progress Payments.
 - C. STEEL PLANTER BOXES - Measurement and Payment shall be Lump Sum Quantity (LSQ) as shown in the Schedule of Items for the weathering steel planter boxes shown on the landscape plans constructed and completed ready for use. This pay item does not include the plants and planting media or irrigation which is listed in other optional bid items.
- 1.4 RELATED WORK
- A. The work **for the building line item** shall be in accordance with the following specifications. The subsidiary specifications are referred to in the text by the Section designation only.

DIVISION 01 GENERAL REQUIREMENTS

SECTION 010250- CONSTRUCTION STAKING

SECTION 011250 – MEASUREMENT AND PAYMENT WITH ASPHALT

SECTION 013300 - SUBMITTAL PROCEDURES

SECTION 014100 – QUALITY CONTROL

DIVISION 02 EXISTING CONDITIONS

SECTION 024100- SEDIMENTATION AND EROSION CONTROL

SECTION 024100 - WASTE MATERIAL DISPOSAL

DIVISION 03 CONCRETE

SECTION 033000 – CAST-IN-PLACE CONCRETE

SECTION 033510 – POLISHED CONCRETE FINISHING

DIVISION 04 - Not Used

DIVISION 05 METALS

SECTION 051200 – STRUCTURAL STEEL FRAMING

SECTION 055000- METAL FABRICATIONS

DIVISION 06 WOOD, PLASTICS & COMPOSITES

SECTION 061000 – ROUGH CARPENTRY

SECTION 061500 – TONGUE AND GROOVE WOOD CEILING AND SOFFIT

SECTION 061600 – SHEATHING

SECTION 064023 – INTERIOR ARCHITECTURAL WOODWORK

DIVISION 07 THERMAL & MOISTURE PROTECTION

SECTION 071113 – BITUMINOUS DAMPROOFING

SECTION 072100 – THERMAL INSULATION

SECTION 074113.16 – STANDING SEAM METAL ROOF PANELS

SECTION 074213.13 – METAL WALL PANELS

SECTION 074570- CEMENTITIOUS PANELS

SECTION 076200 – SHEET METAL FLASHING & TRIM

SECTION 079200 – JOINT SEALANTS

DIVISION 08 OPENINGS

SECTION 081111 –HOLLOW METAL FRAMES

SECTION 081416 – FLUSH WOOD DOORS
SECTION 082143 – ENTRY DOORS
SECTION 083113 – ACCESS DOORS AND FRAMES
SECTION 084113 – ALUMINUM STOREFRONT
SECTION 085200 – ALUMINUM CLAD WOOD WINDOWS
SECTION 087100 – DOOR HARDWARE
SECTION 088000 – GLAZING

DIVISION 09 FINISHES

SECTION 092500 – GYPSUM BOARD
SECTION 093000 – TILING
SECTION 096810 – CARPET TILE
SECTION 096400 – WOOD FLOORING
SECTION 096513- RESILIENT BASE AND ACCESSORIES
SECTION 097700 – SPECIAL WALL FINISHES
SECTION 099123 – PAINTING
SECTION 099300 – STAINING & TRANSPARENT FINISHING
SECTION 099600 – HIGH PERFORMANCE COATINGS

DIVISION 10 SPECIALTIES

SECTION 101401 – BUILDING INTERIOR SIGNAGE
SECTION 101550 – TOILET COMPARTMENTS
SECTION 102239 – FOLDING PANEL PARTITIONS
SECTION 102800 – TOILET, BATH & LAUNDRY ACCESSORIES
SECTION 105201 – FIRE PROTECTION SPECIALTIES

DIVISION 11– EQUIPMENT

SECTION 113100 – APPLIANCES

DIVISION 12 FURNISHINGS

SECTION 122113 – ROLLER WINDOW SHADES
SECTION 124813 – ENTRANCE FLOOR MATS AND FRAMES

DIVISION 13 THROUGH 21 – Not Used

DIVISION 22 PLUMBING

SECTION 220517 – SLEEVES & SLEEVE SYSTEMS FOR PLUMBING PIPING
SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING
SECTION 220529 – HANGERS & SUPPORTS FOR PLUMBING PIPING & EQUIPMENT
SECTION 220553 – IDENTIFICATION FOR PLUMBING PIPING & EQUIPMENT
SECTION 220719 – PLUMBING PIPING INSULATION
SECTION 221100 – WATER DISTRIBUTION SYSTEMS
SECTION 221116 – DOMESTIC WATER PIPING
SECTION 221119 – DOMESTIC WATER PIPING SPECIALTIES
SECTION 221316 – SANITARY WASTE & VENT PIPING
SECTION 221319 – SANITARY WASTE PIPING SPECIALTIES
SECTION 223400 – FUEL-FIRED DOMESTIC WATER HEATERS
SECTION 224100 – RESIDENTIAL PLUMBING FIXTURES
SECTION 224213.13 – COMMERCIAL WATER CLOSETS
SECTION 224213.16 – COMMERCIAL URINALS
SECTION 224216.13 – COMMERCIAL LAVATORIES
SECTION 224217.16 – COMMERCIAL SINKS
SECTION 224716 – PRESSURE WATER COOLERS

DIVISION 23 HEATING VENTILATING AND AIR CONDITIONING

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

SECTION 230519 - METERS AND GAGES FOR HVAC PIPING
SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
SECTION 230548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC
SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC
SECTION 230713 - DUCT INSULATION
SECTION 230719 - HVAC PIPING INSULATION
SECTION 231126 – FACILITY LIQUIFIED-PETROLEUM GAS PIPING
SECTION 232300 – REFRIGERANT PIPING
SECTION 233113 - METAL DUCTS
SECTION 233300 - AIR DUCT ACCESSORIES
SECTION 233713.13 – AIR DIFFUSERS
SECTION 233713.23 - AIR REGISTERS AND GRILLES
SECTION 235416.13 – GAS FIRED FURNACES
SECTION 236313 – AIR-COOLED REFRIGERANT CONDENSERS
SECTION 238216.13 – REFRIGERANT AIR COILS

DIVISION 26 ELECTRICAL

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL
SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS
SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
SECTION 260923 – LIGHTING CONTROL SYSTEMS
SECTION 262726 - WIRING DEVICES
SECTION 265100 – INTERIOR LIGHTING

DIVISION 27 COMMUNICATIONS

SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS
SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS
SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS
SECTION 271200 – COMMUNICATIONS COPPER NETWORK CABLING

DIVISION 28 NOT USED

DIVISION 31 EARTHWORK

SECTION 311000 - CLEARING AND GRUBBING
SECTION 311010 - SITE CLEARING
SECTION 312000 – EARTHWORK
SECTION 312100 – PROJECT PREPARATION AND GRADING
SECTION 312225 - EXCAVATION & EMBANKMENT

DIVISION 32 EXTERIOR IMPROVEMENTS

SECTION 321204 - CRUSHED AGGREGATE BASE OR SURFACE COURSE
SECTION 329400 – LANDSCAPE STONE, WOOD MULCH, WEED BARRIER & STEEL EDGING

DIVISION 33 UTILITIES

PART 2 - PRODUCTS - Not Applicable

PART 3 - EXECUTION

3.1 GENERAL

- A. Work shall be completed in accordance with the contract drawings and specifications.

END OF SECTION 000501

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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 010250 - CONSTRUCTION STAKING

PART 1 - GENERAL

1.1 SUMMARY

- A. This work shall consist of the construction staking of roads, parking lots, sidewalks, culverts, buildings, and utilities in accordance with the Drawings and Specifications. The work includes the furnishing of all labor, equipment, instruments, materials, transportation and other incidentals necessary to complete the construction staking in accordance with these specifications and acceptable engineering practice.

1.2 QUALITY CONTROL

- A. Construction staking shall be accomplished under the direction of a Civil Engineer, Engineering Technician, or Land Surveyor closely associated and familiar with construction staking; periodic visits to the project site are required.

1.3 MEASUREMENT AND PAYMENT

- A. Measurement shall be lump sum for surveying and staking the project through all phases of construction.

PART 2 - PRODUCTS

2.1 GOVERNMENT-FURNISHED SURVEY CONTROL SHEETS

- A. The Government will provide the contractor with a set of survey control sheets showing horizontal and vertical control for site to be staked. The Government will provide the Contractor with layout information on the drawings that will include:
 - 1. Control Points - Northing, Easting, Existing Elevations.
 - 2. Parking Areas - Northing, Easting, and Finish Elevations centerline and edge of roads, parking areas at: grade breaks, PC, PT, and intersections.
 - 3. Buildings and Other Structures - Northing, Easting, and Finish Elevations for corners of buildings, other structures (septic tanks, fencing, etc).
 - 4. Utility Lines - Northing, Easting, and Existing Ground Elevations for centerline of utilities (Water Line, Sewer Line, Electrical Lines).

2.2 STAKES

- A. Identification stakes and hubs shall be of sufficient length and width to provide and solid set in the ground and to provide space for marking above ground when applicable. Other dimensions and materials may be used, such as steel reinforcing bars, wire flagging and markers, and metal pins, if approved in writing by the Contracting Officer (CO). The top 2 inches of all slope, guard, reference, clearing, and structure stakes shall be painted or marked with plastic flagging. Colors used on stakes or for flagging shall be as follows:
 - 1. Roads, parking lots, -Orange
 - 2. Waterlines, utilities, and culverts -Blue
 - 3. Buildings, excavation and grading -Yellow

2.3 SURVEY NOTE PAPER AND BOOKS

- A. Paper for survey notes shall be moisture-resistant paper. Notes shall be contained in books with covers that will protect the contents and retain the pages in numerical sequence during field use. Field notebooks or note paper shall be furnished by the contractor.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall be required to provide all necessary staking and control for all phases of construction. The contractor shall use the data and information shown on the project drawings to establish the location of all facilities to be constructed under this contract. The Contractor may choose any method of establishing horizontal and vertical controls provided the following minimum precision and accuracy requirements are met.
- B. Accuracy requirements:
 - 1. Minimum position close; 1/1000
 - 2. Vertical closure: 0.05 ft (vertical)/station (100 feet horizontal)
 - 3. Cross section and slope stake precision:
- C. Allowable deviation of cross section line projection from a true perpendicular to tangents, a true bisector of angle points, or a true radius of curves: +/-3 degrees.
- D. Cross section topography measurements shall be taken so that variations in ground form a straight line connecting the cross section points will not exceed: 1.0 ft.
- E. Horizontal and vertical accuracy for slope stake, slope stake references, and clearing limits. In feet or percentage of horizontal distance measured from centerline or reference stake, whichever is greater. Slope reference stakes and slope stakes: 0.15 ft or 0.6%. Clearing limits: 1.0 ft.

3.2 ESTABLISHING AND REFERENCING IMPROVEMENT LOCATIONS

- A. Access Roads, Parking Spurs, and Parking lots:
 - 1. Slope stakes (cut and fill catch points), clearing limits, and slope stake references shall be established on both sides of the centerline at each station established. Slope stakes and slope stake references shall be located on a line at right angles to tangents and on radial lines or curves. Slope stake catch points shall be located by using the grading plans and/or profiles, typical road section templates, as shown on the drawings and the information provided with staking points.
 - 2. Slope stakes shall be set at 50-foot intervals, at significant breaks in the ground profile, culvert locations, and widening transition points. Slope stakes shall be set at 25 foot intervals around curves having a radius less than 100 feet.
- B. Culverts
 - 1. Slope stakes and slope reference stakes shall be set at all culvert locations. A culvert reference stake and hub shall be set on the centerline of the culvert 10 feet from each end or beyond the clearing limit, whichever is greater. The following shall be recorded on these stakes:
 - a. The actual field measured length
 - b. The vertical and horizontal distance from hubs to the invert at the ends of the culvert.
- C. Waterline, Sewerline, & other Utilities
 - 1. Waterline, Sewerline, & other Utilities shall be staked at the locations shown on the drawings with the specified minimum burial depth. Waterline and sewerline elevations shall be accurately staked to provide for drainage as indicated on the drawings. Grade stakes shall be established as necessary to provide the control for the construction work.
- D. Buildings
 - 1. Slope stakes and slope stake references shall be established at each corner and as necessary to provide adequate construction control.

3.3 DISCREPANCIES

- A. The contractor shall compare the staked centerline horizontal and vertical alignment with the design data. Differences between previously recorded and observed elevations of bench marks shall be referred to the Contracting Officer. Differences in centerline profile elevations exceeding 1 foot at any two or more

consecutive points shall be reported to the contracting Officer for evaluation and possible revision. Staking of these areas shall be deferred until the Contracting Officer resolves these differences.

3.4 VERTICAL CONTROL

- A. Vertical control for construction shall be as referenced on the Drawings.

3.5 MARKING STAKES

- A. All stakes shall be legibly marked, in the format agreed upon with the Contracting Officer, with a stake pencil that leaves an imprinted or with waterproof ink. Marking shall conform to the nomenclature below;

PI	Point of Intersection of tangents
PC	Point of curvature
POC	Point on curve
Pt	Point of tangency
POT	Point on tangent
RP	Reference point
P	P-line (preliminary location line)
L	L-line (final location line)
BM	Bench mark
TBM	Temporary bench mark
BT	Begin taper (any)
ET	End taper (any)
C	Cut
F	Fill
L	Centerline
D	Ditch
W	Width

3.6 SURVEY NOTES

- A. All survey data shall be neatly recorded in survey books. All survey notes shall become the property of the Forest Service. Errors shall be deleted by lining out. Date, crew names and positions, instrumentation, and weather shall be recorded in the notes at the beginning of each day's work. The party chief shall sign or initial each page of the notes immediately after the last entry for each day's work.
- B. Electronically recorded survey notes shall be consecutively numbered and headed to identify the contents. The notes shall be supported and accompanied by a bound book that records the project name and for each day identifies date, crew names and positions, instrumentation, weather, type of survey, stationing of sections between which survey was performed, and survey data or sketched that cannot be electronically recorded. The party chief shall sign or initial the electronically recorded notes and Day Book immediately after the last entry for each day's work.

END OF SECTION 010250

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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 011250 - MEASUREMENT AND PAYMENT WITH ASPHALT

PART 1 - GENERAL

1.1 SUMMARY

- A. Measurement and payment for contract work will be made only for and under those pay items included in the Schedule of Items. All other work, labor, materials, equipment, and incidentals necessary to successfully complete the project will be considered as included in the payment for items shown. This section defines the method of measurements and basis of payment for work items listed in the Schedule of Items.
- B. When more than one class, size, type, thickness, etc. is specified in the Schedule of Items for any pay item, suffixes will be added to the item number to differentiate between the pay items.

1.2 DETERMINATION OF QUANTITIES

- A. The following measurements and calculations shall be used to determine contract quantities for payment.
 - 1. For Structures, they shall be measured according to neat lines shown on the drawings or as altered by the CO, in writing, to fit field conditions.
 - 2. For standard manufactured items (such as fence, wire, plates, rolled shapes, pipe conduits) identified by gauge, weight, section dimensions, and so forth, such identifications shall be considered the nominal weights or dimensions. Unless controlled by tolerances in cited specifications, manufacturer's tolerances shall be accepted.

1.3 UNITS OF MEASUREMENT

- A. Payment shall be by units defined and determined according to U.S. Standard measure and by the following:
 - 1. Each (EA): One complete unit, which may consist of one or more parts.
 - 2. Lump Sum (LS): One complete unit.

1.4 METHOD OF MEASUREMENT

- A. One of the following methods of measurement for determining final payment is designated on the Schedule of Items for each pay item:
 - 1. ACTUAL QUANTITIES (AQ) - These quantities are determined from actual measurements of completed work.
 - 2. LUMP SUM QUANTITIES (LSQ) - These quantities denote one complete unit of work as required by or described in the contract, including necessary materials, equipment, and labor to complete the job. They shall not be measured.

1.5 PRICE ADJUSTMENT (for Out-of-Specification Bituminous Materials)

- A. Bituminous materials are defined as all types and grades of asphalt cement, liquid asphalt, emulsified asphalt, and dust oil.
- B. If bituminous material fails one or more test requirements, and the Contracting Officer determines it is in the public interest to accept the material at a reduced price, the price reduction shall be based on the test results giving the largest percent price adjustment. The contractor may remove and replace the defective material or accept the adjustment.
- C. The price reduction shall apply to all pay items affected.
- D. Price adjustment will be based on samples taken in duplicate in accordance with AASHTO T40 under the supervision of the Contracting Officer. Samples shall be sent to an authorized laboratory. The laboratory shall test one of each duplicate sample and retain the other. When any test result is not within the

specification limits, the laboratory shall immediately notify the Contractor, the supplier, and the Contracting Officer. The Contractor, after notifying the Contracting Officer, may check test the retained sample.

- E. If the retained sample tests satisfactorily, the material will be accepted. If the retained sample also fails, the following schedule of price adjustments shall apply. The average of test values for the two samples will determine the basis for price adjustment, except when test results on the samples differ by more than the applicable AASHTO or ASTM Repeatability Unit; then, the test result numerically nearest the specification requirement will be used. (A repeatability unit is defined as D2S or D2S% limit for single operator precision described in ASTM C670.)
- F. The schedule of price adjustments shall not apply to the following tests:

Test	AASHTO Test Method
Spot Test	T102
Particle Charge	T59
Ductility	T51

- G. Bituminous materials failing to meet specifications for these tests shall be removed and replaced.
- H. See Table 011250-1 for the schedule of price adjustments for bituminous materials that do not meet specifications.

Table 011250-1				
Schedule of Price Adjustments for Out-of-Specification Bituminous Materials.				
Application	Deviation from Specification Limit Measured in Reproducibility Units*.			
	Less than 1	1 but less than 2	2 but less than 3	3 or more
Price reduction applicable to bituminous base course and pavement mixture or to seal coat and bituminous material paid for as a separate item.	0%	5%	25%	Remove & Replace
Price reduction applicable to bituminous material paid for as a separate item.	0%	10%	25%	Remove & Replace
* A reproducibility unit is defined as D2S or D2S% limit for multi-laboratory precision described in ASTM recommended practice C670.				

The Sieve Test (AASHTO T59) results may be exempt from the Schedule of Price Adjustments provided the contractor's quality assurance program includes checking the uniformity of bituminous spread rates in increments no greater than 1 foot over the width of the spray bar and variation between increments is no greater than 5 percent.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 011250

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 011900 - MOBILIZATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This item is intended to compensate the Contractor for operations including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site; for payment of premiums for bonds and insurance for the project; and for any other work and operations which must be performed or costs that must be incurred incident to the initiation of meaningful work at the site and for which payment is not otherwise provided for under the contract.

1.2 MEASUREMENT AND PAYMENT

- A. The measurement shall be lump sum for mobilization. Payment shall be as follows:
 - 1. Bond premiums will be reimbursed after receipt of the evidence of payment.
 - 2. 50% of the lump sum, not to exceed 5% of the original contract amount, will be paid following completion of 5% of the original contract amount not including mobilization and bond premiums.
 - 3. Payment of the remaining portion of the lump sum, up to 10% of the original contract amount, will be paid following completion of 10% of the original contract amount not including mobilization and bond premiums.
 - 4. Any portion of the lump sum in excess of 10% of the original contract amount will be paid after final acceptance.
 - 5. Progress payments for mobilization and preparatory work shall be subject to retainage.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 011900
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals. See Table 013300-1 for a summary of required submittals.
- B. See other specification section within this package for additional requirements on submittal.

1.2 SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. The Contracting Officer (CO) reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on CO's receipt of submittal.
 - 1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. CO will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Allow 14 days for processing each re-submittal.
 - 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- C. Identification: Place a permanent label or title block on each submittal for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space on label or beside title block to record Contractor's review and approval markings and action taken by CO.
 - 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Contractor.
 - d. Name of manufacturer.
 - e. Unique identifier, including revision number.
 - f. Number and title of appropriate Specification Section.
 - g. Drawing number and detail references, as appropriate.
 - h. If more than one item is shown on submittal sheet, identify item.
- D. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- E. Additional Copies: Unless additional copies are required for final submittal, and unless CO observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
- F. Use for Construction: Use only final submittals with mark indicating action taken by CO in connection with construction.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement and/or payment will be made for this section. Payment shall be included with work shown in the schedule of items.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS – (Submittals requiring CO approval)

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
 - 1. Number of Copies: Submit PDF copies of each submittal, unless otherwise indicated. CO will return two copies. Mark up and retain one returned copy as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Manufacturer's catalog cuts.
 - e. Wiring diagrams showing factory-installed wiring.
 - f. Compliance with recognized trade association standards.
 - g. Compliance with recognized testing agency standards.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Notation of dimensions established by field measurement.
 - 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- D. Contractor's Construction Schedule: The contractor shall submit a Construction Schedule, for approval by CO, in accordance with the contract provisions within 5 day of commencement of work.
- E. Samples: Prepare **physical** units of materials or products, including the following:
 - 1. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

2.2 INFORMATIONAL SUBMITTALS – (Submittals NOT requiring CO approval)

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit PDF copies of each submittal, unless otherwise indicated. CO will not return copies.
 - 2. Certificates and Certifications: Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 3. Test and Inspection Reports: Comply with requirements in Section 014100 "Quality Control."

- B. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- C. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- D. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.
- E. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to CO.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- C. CO will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.
- E. Substitutions – Whenever materials, products, and equipment are listed by name or brand in the specifications and/or on the drawings, it is used as a measure of quality, utility, or standard. If the Contractor prefers to use any other brand or manufacturer of same quality, appearance and utility to that specified, he shall request substitution as provided below, not less than 30 days before the planned installation of the item. The Contracting Officer will approve or disapprove the request for substitution.
- F. Requests for substitutions will only be considered if contractor submits the following:
 - 1. Complete technical data including drawings, complete performance specifications, test data, samples and performance tests of the article proposed for substitution. Submit additional information if required by Contracting Officer. All items in the above information shall be circled, tagged, or marked in some way to indicate all deviations or differences which the proposed item differs from the originally specified item.
 - 2. Similar data as above for item originally specified. All items shall be marked to identify where/how the proposed substitution will differ.
 - 3. A statement by the Contractor that the proposed substitution is in full compliance with the contract documents, applicable codes, and laws.
 - 4. The Contractor shall be responsible for any effect upon related work in the project for any substitution and shall pay any additional costs generated by any substitutions.

- 3.2 SUBMITTAL SCHEDULE – Submittals shall be made as required by and called for in the drawings and specifications. The following table is a summary of the required submittals for the project - the table is to assist the Contractor and may not be all inclusive – additional submittals may be required by specific specifications:

TABLE 013000-1

Spec. Section	Section Title	Subject ion	Required Submittal
C	General Specifications	1.4A	Traffic Control Plan
013300	Submittal Procedures	2.1D	Construction Schedule

Spec. Section	Section Title	Subsection	Required Submittal
014100	Quality Control	1.3 A	Contractor quality control plan
014100	Quality Control	1.3 B	Permits, Licenses, and Certificates
014100	Quality Control	1.3 C	Test and inspection reports
014100	Quality Control	1.3 D	As-Built drawings
023701	Sediment & Erosion Control Measures	1.2A	Sediment & Erosion Control Plan
033000	Cast-in-Place Concrete	1.3A	Product Data
033000	Cast-in-Place Concrete	1.3B	Design Mix
033000	Cast-in-Place Concrete	1.3C	Quality Control Test Reports
033000	Cast-in-Place Concrete	1.3F	Contraction and Expansion Joint Layout
033510	Polished Concrete Finishing	1.4A	Product Data
033510	Polished Concrete Finishing	1.4B	Quality Assurance
033510	Polished Concrete Finishing	1.4C	Warranty
033510	Polished Concrete Finishing	1.4D	Operation and Maintenance Data
051200	Structural Steel Framing	1.3A	Product Data
051200	Structural Steel Framing	1.3B	Shop Drawings-See Spec.
051200	Structural Steel Framing	1.4A	Qualification Data for Installer, fabricator, and testing agency.
051200	Structural Steel Framing	1.4B	Welding certificates.
051200	Structural Steel Framing	1.4C	Product Test reports. See spec.
051200	Structural Steel Framing	1.4D	Field Quality Control and Special Instruction reports. See spec.
055000	Metal Fabrications	1.2A	Product Data
061000	Rough Carpentry	1.3A	Product Data
061000	Rough Carpentry	1.3B	Material Certificates
061000	Rough Carpentry	1.3C	Research & Evaluation Reports
061500	T&G Wood Ceiling and Soffit	1.2A	Product Data
061600	Sheathing	1.2.A	Product Data
061600	Sheathing	1.2.B	Research & Evaluation Reports
064023	Interior Architectural Woodwork	1.2A	Product Data
064023	Interior Architectural Woodwork	1.2B	Shop Drawing
064023	Interior Architectural Woodwork	1.2C	Samples
064023	Interior Architectural Woodwork	1.2D	Qualification Data
071113	Bituminous Dampproofing	1.2A	Product Data
072100	Thermal Insulation	1.4A	Product Data
074113.1 6	Standing-Seam Metal Roof Panels	1.3A	Product Data
074113.1 6	Standing-Seam Metal Roof Panels	1.3B	Shop Drawings
074113.1 6	Standing-Seam Metal Roof Panels	1.3C	Samples
074113.1 6	Standing-Seam Metal Roof Panels	1.4A	Qualification Data
074113.1 6	Standing-Seam Metal Roof Panels	1.4B	Product Test Reports
074113.1 6	Standing-Seam Metal Roof Panels	1.4C	Warranties
074113.1 6	Standing-Seam Metal Roof Panels	1.5A	Maintenance Data

Spec. Section	Section Title	Subsection	Required Submittal
074213.13	Metal Wall Panels	1.3A	Product Data
074213.13	Metal Wall Panels	1.3B	Shop Drawings
074213.13	Metal Wall Panels	1.3C	Samples
074213.13	Metal Wall Panels	1.4A	Product Test Reports
074213.13	Metal Wall Panels	1.4B	Warranties
074213.13	Metal Wall Panels	1.5A	Maintenance Data
074570	Cementitious Panels	1.4A	Product Data
074570	Cementitious Panels	1.4B	Shop Drawings
074570	Cementitious Panels	1.4C	Samples
076200	Sheet Metal Flashing and Trim	1.3A	Product Data
076200	Sheet Metal Flashing and Trim	1.3B	Samples
079200	Joint Sealants	1.2A	Product Data
081111	Hollow Metal Frames	1.3A	Product Data
081111	Steel Doors and Frame	1.3B	Product test reports
081111	Steel Doors and Frame	1.3C	Shop Drawings
081416	Flush Wood Doors	1.2A	Product Data
081416	Flush Wood Doors	1.2B	Shop Drawings
081416	Flush Wood Doors	1.2C	Warranty
082143	Entry Doors	1.2A	Product Data
082143	Entry Doors	1.2B	Shop Drawings
082143	Entry Doors	1.2C	Warranty
083113	Access Doors and Frames	1.2A	Product Data
084113	Aluminum Storefront	1.3A	Product Data
084113	Aluminum Storefront	1.3B	Shop Drawings
084113	Aluminum Storefront	1.3C	Design
084113	Aluminum Storefront	1.4A	Warranty
084113	Aluminum Storefront	1.5A	Maintenance Data
085200	Aluminum Clad Wood Windows	1.2A	Product Data
085200	Aluminum Clad Wood Windows	1.2B	Shop Drawings
085200	Aluminum Clad Wood Windows	1.2C	Product Schedule
085200	Aluminum Clad Wood Windows	1.3A	Test Reports
085200	Aluminum Clad Wood Windows	1.3B	Maintenance Data
085200	Aluminum Clad Wood Windows	1.3C	Warranty
087100	Door Hardware	1.2A	Product Data
087100	Door Hardware	1.2B	Door Hardware Sets & Key Schedule
087100	Door Hardware	1.5A	Warranty
088000	Glazing	1.3A	Product Data
092900	Gypsum board	1.2A	Product Data
093000	Tiling	1.4A	Product Data
093000	Tiling	1.4B	Samples
093000	Tiling	1.4C	Extra Materials
096810	Carpet Tile	1.2A	Product Data

Spec. Section	Section Title	Subsection	Required Submittal
096810	Carpet Tile	1.2B	Sample
096810	Carpet Tile	1.2C	Maintenance Data
096400	Wood Flooring	1.2A	Product Data
096400	Wood Flooring	1.2B	Samples
096513	Resilient Base and Accessories	1.2A	Product Data
096513	Resilient Base and Accessories	1.2B	Samples
097700	Special Wall Finishes	1.2A	Product Data
097700	Special Wall Finishes	1.2B	Samples
097700	Special Wall Finishes	1.2C	Test Reports
097700	Special Wall Finishes	1.2D	Maintenance Data
099120	Painting	1.2A	Product Data
099120	Painting	1.2B & C	Color Samples
099300	Staining and Transparent Finishing	1.2A	Product Data
099300	Staining and Transparent Finishing	1.2B & C	Color Samples
099600	High-Performance Coatings	1.2A	Product Data
099600	High-Performance Coatings	1.2B & C	Color Samples
101400	Exterior Signs	1.2A	Sign List
101401	Building Interior Signage	1.3A	Product Data
101401	Building Interior Signage	1.3B	Shop Drawings
101401	Building Interior Signage	1.3C	Samples for Initial Selection
101401	Building Interior Signage	1.3D	Sign Schedule
101550	Toilet Compartments	1.2A	Product Data
101550	Toilet Compartments	1.2B	Shop Drawings
101550	Toilet Compartments	1.2C	Samples for Initial Selection
102239	Folding Panel Partitions	1.3A	Product Data
102239	Folding Panel Partitions	1.3B	Shop Drawings
102239	Folding Panel Partitions	1.3C	Samples
102239	Folding Panel Partitions	1.4A	Product Certificates
102239	Folding Panel Partitions	1.4B	Test Reports
102239	Folding Panel Partitions	1.4C	Warranty
102239	Folding Panel Partitions	1.5C	Operation and Maintenance Data
102800	Toilet and Bath Accessories	1.2A	Product Data
102800	Toilet and Bath Accessories	1.2B	Maintenance Data
105201	Fire Protection Specialties	1.2A	Product Data
105201	Fire Protection Specialties	1.2B	Maintenance Data
113100	Appliances	1.2A	Product Data
113100	Appliances	1.2B	Operation and Maintenance Data
122413	Roller Window Shades	1.2A	Product Data
122413	Roller Window Shades	1.2B	Shop Drawings
122413	Roller Window Shades	1.2C	Samples
122413	Roller Window Shades	1.2D	Maintenance Data
124813	Entrance Floor Mats and Frames	1.3A	Product Data
124813	Entrance Floor Mats and Frames	1.3B	Samples for Initial Selection
124813	Entrance Floor Mats and Frames	1.3C	Maintenance Data
129300	Site Furnishings	1.2A	Product Data

Spec. Section	Section Title	Subsection	Required Submittal
221100	Water Distribution Systems	1.3A	Product Data
221100	Water Distribution Systems	1.3B	Disposal Plan
221100	Water Distribution Systems	1.3C, D	Operations and Maintenance
221300	Onsite Wastewater Treatment Systems	1.3A	Product Data
221300	Onsite Wastewater Treatment Systems	1.3B	Shop Drawings
220517	Sleeves and Sleeve Seals for Plumbing Piping	1.3A	Product Data
220519	Meters and Gages for Plumbing Piping	1.3A	Product Data
220519	Meters and Gages for Plumbing Piping	1.3B	Product Certificates
220519	Meters and Gages for Plumbing Piping	1.3C	Operations and Maintenance Data
220529	Hangers and Supports for Plumbing Piping and Equipment	1.4A	Product Data
220529	Hangers and Supports for Plumbing Piping and Equipment	1.4B	Welding Certificates
220553	Identification for Plumbing Piping	1.3A	Product Data
220719	Plumbing Piping Insulation	1.3A	Product Data
220719	Plumbing Piping Insulation	1.3B	Field Quality-Control Reports
221116	Domestic Water Piping	1.4A	Product Data
221116	Domestic Water Piping	1.4B	Purging & Disinfecting Reports
221116	Domestic Water Piping	1.4C	Quality Control Reports
221119	Domestic Water Piping Specialties	1.3A	Product Data
221119	Domestic Water Piping Specialties	1.3B	Field Quality-Control Test Reports
221119	Domestic Water Piping Specialties	1.3C	Operation and Maintenance Data
221316	Sanitary Waste and Vent Piping	1.4A	Product Data
221316	Sanitary Waste and Vent Piping	1.4B	Seismic Qualification Certificates
221316	Sanitary Waste and Vent Piping	1.4C	Field Quality-Control Test Reports
221319	Sanitary Waste Piping Specialties	1.3A	Product Data
223400	Fuel-Fired, Domestic Water Heaters	1.4A	Product Data
223400	Fuel-Fired, Domestic Water Heaters	1.5A	Seismic Qualification Certificates
223400	Fuel-Fired, Domestic Water Heaters	1.5B	Product certificates
223400	Fuel-Fired, Domestic Water Heaters	1.5C	Domestic-Water Heater Labeling
223400	Fuel-Fired, Domestic Water Heaters	1.6A	Operation and Maintenance Data
224100	Residential Plumbing Fixtures	1.3A	Product Data
224100	Residential Plumbing Fixtures	1.3B	Shop Drawings
224100	Residential Plumbing Fixtures	1.3C	Coordination Drawings
224100	Residential Plumbing Fixtures	1.3D	Maintenance Data
224213.13	Commercial Water Closets	1.4A	Product Data
224213.13	Commercial Water Closets	1.4B	Operation and Maintenance Data
224213.13	Commercial Water Closets	1.4C	Extra Materials – See Spec
224213.16	Commercial Urinals	1.3A	Product Data
224213.16	Commercial Urinals	1.4A	Operation and Maintenance Data
224216.13	Commercial Lavatories	1.4A	Product Data

Spec. Section	Section Title	Subsection	Required Submittal
224216.13	Commercial Lavatories	1.4B	Coordination Drawings
224216.13	Commercial Lavatories	1.4C	Operation and Maintenance Data
224216.13	Commercial Lavatories	1.4D	Extra Materials – See Spec
224216.16	Commercial Sinks	1.4A	Product Data
224216.16	Commercial Sinks	1.4B	Coordination Drawings
224216.16	Commercial Sinks	1.4C	Operation and Maintenance Data
224716	Pressure Water Coolers	1.3A	Product Data
224716	Pressure Water Coolers	1.3B	Shop Drawings
224716	Pressure Water Coolers	1.3C	Operation and Maintenance Data
230517	Sleeves and Sleeve Seals for HVAC Piping	1.3A	Product Data
230519	Meters and Gages for HVAC Piping	1.3A	Product Data
230519	Meters and Gages for HVAC Piping	1.3B	Wiring Diagrams
230519	Meters and Gages for HVAC Piping	1.3C	Product Certificates
230519	Meters and Gages for HVAC Piping	1.3D	Operation and Maintenance Data
230523	General-Duty Valves for HVAC Piping	1.3A	Product Data
230529	Hangers and Supports for HVAC Piping and Equipment	1.4A	Product Data
230529	Hangers and Supports for HVAC Piping and Equipment	1.4B	Welding Certificates
230529	Hangers and Supports for HVAC Piping and Equipment	1.4C	Delegated Design
230548	Vibration and Seismic Controls for HVAC	1.3A	Product Data
230548	Vibration and Seismic Controls for HVAC	1.3B	Delegated-Design Submittal
230553	Identification for HVAC Piping and Equipment	1.3A	Product Data
230593	Testing, Adjusting, and Balancing for HVAC	1.4A	Strategies and Procedures Plan
230593	Testing, Adjusting, and Balancing for HVAC	1.4B	Certified TAB Reports
230713	HVAC Insulation	1.3A	Product Data
230713	HVAC Insulation	1.3B	Quality Control Reports
230719	HVAC Piping Insulation	1.3A	Product Data
230719	HVAC Piping Insulation	1.3B	Quality Control Reports
231126	Facility Liquefied-Petroleum Gas Piping	1.4A	Product Data
231126	Facility Liquefied-Petroleum Gas Piping	1.5A	Operation and Maintenance Data
232300	Refrigerant Piping	1.4A	Product Data
232300	Refrigerant Piping	1.4B	Shop Drawings
232300	Refrigerant Piping	1.4C	Welding Certificates
232300	Refrigerant Piping	1.4D	Quality Control Reports
232300	Refrigerant Piping	1.5E	Operation and Maintenance Data
233113	Metal Ducts	1.4A	Product Data
233113	Metal Ducts	1.4B	Welding Certificates
233300	Air Duct Accessories	1.3A	Product Data

Spec. Section	Section Title	Subsection	Required Submittal
233300	Air Duct Accessories	1.3B	Operation and Maintenance Data
233713.13	Air Diffusers	1.3A	Product Data
233713.23	Air Registers, and Grilles	1.3A	Product Data
235416.13	Gas-Fired Furnaces	1.3A	Product Data
235416.13	Gas-Fired Furnaces	1.3B	Shop Drawings
235416.13	Gas-Fired Furnaces	1.3C	Operation and Maintenance Data
235416.13	Gas-Fired Furnaces	1.4A	Warranty
236313	Air-Cooled Refrigerant Condensers	1.3A	Product Data
236313	Air-Cooled Refrigerant Condensers	1.3B	Shop Drawings
236313	Air-Cooled Refrigerant Condensers	1.3C	Operation and Maintenance Data
238216.13	Refrigerant Air Coils	1.3A	Product Data
238216.13	Refrigerant Air Coils	1.4A	Operation and Maintenance Data
260500	Common Work Results for Electrical	1.2A	Product Data
260533	Raceway and Boxes for Electrical Systems	1.3A	Product Data
260923	Lighting Control Devices	1.2A	Product Data
260923	Lighting Control Devices	1.2B	Operation and Maintenance Data
260923	Lighting Control Devices	1.2B1	Shop Drawings
262726	Wiring Devices	1.3A	Product Data
262726	Wiring Devices	1.3B	Operation and Maintenance Data
270500	Common Work Results for Communications	1.3A	Qualification Data
270500	Common Work Results for Communications	1.3B	Product Data
270500	Common Work Results for Communications	1.3C	As-Built Drawings and Operation and Maintenance Manuals
271100	Communications Equipment Room Fittings	1.3A	Product Data
271200	Communications Copper Network Cabling	1.3A	Product Data
312225	Excavation and Embankment	1.3A	Density Test Results
321200	Hot Mix Asphalt Paving	1.2A	Product Data
321200	Hot Mix Asphalt Paving	1.2B	Job Mix Design
321200	Hot Mix Asphalt Paving	1.2C	Material Certificate
321204	Crushed Aggregate Base or Surface Course	1.2A	Aggregate Base – Source, Gradation, Material Properties
321204	Crushed Aggregate Base or Surface Course	1.2B	Compaction Test Results and Proctor
322640	Pavement Markings	1.3A	Product Data
328000	Irrigation System	1.2 A	Irrigation System Design
328000	Irrigation System	1.2 B	Product Data
328000	Irrigation System	1.2 C	Operations and Maintenance Manuals
329200	Drainage Structure	1.2A	Material Samples

Spec. Section	Section Title	Subsect ion	Required Submittal
329400	Landscape Stone, Wood Mulch and Weed Barrier	1.3A	Material Samples
329400	Landscape Stone, Wood Mulch and Weed Barrier	1.3B	Product Data

END OF SECTION 013300
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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 014100 - QUALITY CONTROL

PART 1 - GENERAL

- 1.1 This work shall consist of providing quality control in conformance with the inspection, testing, and product certification requirements of this contract to ensure compliance with the drawings and specifications. The Contractor shall provide all personnel, equipment, tests, and reports necessary to meet the requirements of the contract.
- 1.2 QUALITY CONTROL
 - A. The Contractor shall provide and maintain a quality control system that will ensure all services, supplies, and construction work required under this contract conforms to the contract requirements. The Contractor shall perform, or cause to be performed, the sampling, inspection, and testing required to substantiate that all services, supplies, and construction conform to the contract requirements.
 - B. Special Tests and Inspections: Contractor will engage a testing agency to conduct required special tests and inspections. The Contractor shall authorize the testing agency to perform the required testing and inspections on the work completed. The authority shall include:
 - 1. Testing agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 2. Testing agency will re-test and re-inspect corrected work.
 - C. Retesting/Reinspecting: Contractor shall provide quality-control services for retesting and reinspection for replaced construction work or for work that failed to comply with the requirements under the contract.
- 1.3 SUBMITTALS
 - A. Contractor Quality Control Plan
 - B. Permits, Licenses, and Certificates
 - C. Test and Inspection Reports
 - D. As-Built Drawings
- 1.4 MEASUREMENT AND PAYMENT
 - A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

- 3.1 QUALITY CONTROL SYSTEM
 - A. General: Perform required testing, inspections, sampling, and similar services per direction specified in the contract drawings and specifications and in accordance with established industry standards.
- 3.2 CONTRACTOR QUALITY CONTROL PLAN
 - A. At the time of the preconstruction conference, the Contractor shall submit for approval a written Contractor Quality Control Plan.
 - 1. If the plan requires any revisions or corrections, the Contractor shall resubmit the plan within 10 days.

2. The Government reserves the right to require changes in the plan during the contract period as necessary.
3. No change in the approved plan may be made without written concurrence by the Contracting Officer.
4. At a minimum, the plan shall include the following:
 - a. A list of personnel responsible for quality control and assigned duties. Include each person's qualifications.
 - b. A copy of a letter of direction to the Contractor's Quality Control Supervisor outlining assigned duties.
 - c. Names, qualifications, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms.
 - d. Methods of performing, documenting, and enforcing quality control of all work.
 - e. Methods of monitoring and controlling environmental pollution and contamination as required by all applicable regulations and laws.

3.3 TEST AND INSPECTION REPORTS

- A. Submit PDF copies of complete test results no later than three calendar days after the test was performed.
- B. Submit failing test results and proposed remedial actions within four hours of noted deficiency.
- C. Testing and Inspection Reports shall include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples, tests, or inspections.
 5. Names of individuals performing tests and inspections.
 6. Reference Specification Section(s).
 7. Complete test or inspection data.
 8. Test and inspection results and an interpretation of test results.
 9. Ambient conditions at time sample was taken, tested, or inspected.
 10. Comments or professional opinion on whether tested or inspected work complies with the Contract Document requirements.
 11. Name and signature of laboratory inspector.
 12. Recommendations on retesting and reinspecting.

3.4 PERMITS, LICENSES, AND CERTIFICATES

- A. For Contracting Officer's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations relevant to the on performance of the work.

3.5 AS-BUILT DRAWINGS

- A. The Contractor shall maintain a set of the contract drawings depicting as-built conditions. These drawings shall be maintained in a current condition and shall be available for review. All variations from the original contract drawings shall be indicated in red on the drawings. Upon completion of the contract work, as-built drawings shall be submitted to the Contracting Officer.

3.6 SAMPLING, TESTING, AND CERTIFICATION REQUIREMENTS

- A. Sampling, testing, and Certification requirements and frequency for specific items shall be as specified in the drawings and specification. The following table is a summary of the required sampling, testing, and certification for the project - the table is to assist the Contractor, but may not be all inclusive – additional submittals may be required by specific specification section:

TABLE 014100-1			
Item	Subsection	Certification or Test Required	Frequency
033000	3.13	Mixing and Delivery	Each Truck
033000	3.13	Concrete – Slump, Air, Temperature	1 composite per truck load delivered
033000	3.13	Concrete - Compression Test Specimens	at 7 days and 28 days (see spec)
051200	1.5A	Fabricator Qualifications	Prior to commencement of work
051200	3.4A	Special Inspections	See Spec
051200	3.4C	Bolted Connections	See Spec
051200	3.4D	Welded Connections	See Spec
074113.16	1.6A	Manufacturer's Qualifications	See Spec
074113.16	1.6B	Installer's Qualifications	See Spec
074113.16	1.6C	Mock-Ups	See Spec
102239	1.6A	Installer's Qualifications	See Spec
220529	1.5A	Welding Qualifications	See Spec
220529	1.5B	Pipe Welding Qualifications	See Spec
220719	3.8	Tests and Inspections	See Spec
221116	3.9	Tests and Inspections	See Spec
221119	3.3A	Tests and Inspections	See Spec
221316	3.8	Tests	See Spec.
221300	3.9A	Hydrostatic Testing, Flushing of Pipeline	See Spec.
221300	3.9B	Flushing of Pipeline	Leakage Test
223400	3.3	Inspections and Tests	See Spec.
224716	3.4	Water Cooler Testing	See Spec.
230529	1.5A	Welding Qualifications	See Spec
230529	1.5B	Pipe Welding Qualifications	See Spec
230548	1.4B	Welding Qualifications	See Spec
230593	1.5	Qualifications	See Spec.
230593	Part 3	HVAC Testing & Balancing	See Spec.
230713	3.5	Testing & Inspection	See Spec
230716	3.8	Testing & Inspection	See Spec
231126	3.9	Testing & Inspection	See Spec
232300	1.5	Welding Qualifications	See Spec
233113	1.5	Welding Qualifications	See Spec
233300	3.2	Tests and Inspections	See Spec
233713.13	3.2	Testing and Balancing	See Spec
233713.23	3.2	Testing and Balancing	See Spec
235416.13	3.3	Leak Tests and Operational Tests	See Spec
236313	3.3	Tests and Inspection	See Spec.
238126	3.3	Tests and Inspections	See Spec
238126	3.4	Training of Maintenance Personnel	See Spec
260923	3.4	Field Quality Control	See Spec.
260923	3.5	Adjusting	See Spec.
270500	1.5	Extended Product Warranty	See Spec.
271200	3.4	Field Quality Control	See Spec.
312000	3.13	Multiple Compaction Tests	See Spec
312225	3.12B	Moisture-Density Relationship	One Test for Each Soil Type Encountered
312225	1.3B	Compaction – Subgrade	One test every 1000 sf of subgrade (2 min)
321200	1.3A	Manufacturers Qualifications	See Spec

TABLE 014100-1			
Item	Subsection	Certification or Test Required	Frequency
321200	3.5C	Field Density Tests – Asphalt	One test for every 1000 sf. of pavement
321200	3.4C	Thickness – Asphalt	One test for every 1000 sf. of pavement
321204	3.4A	Compaction Tests – Road Base and Surface Course	One test for every 1000 sf of aggregate

END OF SECTION 014100
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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 023701 - SEDIMENT AND EROSION CONTROL MEASURES

PART 1 - GENERAL

- 1.1 The work under this section consists of furnishing all necessary labor, equipment, materials, and performing all operations in connection with construction sediment and control measures. Contractor shall be responsible for obtaining necessary permits through the DEQ associated with erosion control.
- A. General
1. All erosion and sediment control measures are to be placed prior to any disturbance caused by grading and or excavation and shall conform to the requirements of the appropriate regulatory agency for the State.
 2. The Contractor shall be solely responsible for ensuring that erosion and sediment control measures are implemented and maintained at the site.
 3. Soil disturbing activities include but are not limited to: Clearing and grubbing, excavation for utilities and foundations, roadway and parking lot construction, construction or modification of site drainage, grading, and preparation for final seeding.
- 1.2 SUBMITTALS
- A. The Contractor shall be required to submit a sediment and erosion control plan in accordance with this specification for approval by the Contracting Officer 2 weeks prior to start of work.
- 1.3 MEASUREMENT AND PAYMENT
- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

- 2.1 STRAW WATTLES OR ROLLS
- A. Furnish straw wattles or rolls that are manufactured from weed free straw and wrapped in a tubular photodegradable plastic netting made from 85% high density polyethylene, 14% ethyl vinyl acetate and 1% color for UV inhibition. Conform to the following:
1. Diameter 9 inches min.
 2. Netting strand thickness 0.030 inches
 3. Netting knot thickness 0.055 inches
 4. Mass of netting 0.315 to 0.385 ounces per foot

PART 3 - EXECUTION

- 3.1 CONSTRUCTION
- A. Install straw bales at local drainage ways to prevent silt intrusion upon adjacent drainage courses. Remove straw bales following establishment of vegetation cover and utilize as mulch at swales or on steep slopes.
 - B. Prior to construction, install straw wattles along the downhill construction limits to prevent silt intrusion upon adjacent land.
 - C. Install sediment and erosion control measures on the down slope toe of all top soil stock piles.
 - D. Maintain and remove all erosion controls as specified.
 - E. Temporary seeding shall be placed on exposed surfaces that will not be brought to final grading or permanent cover treatment within 30 days of the exposure to reduce erosion and sedimentation by

stabilizing exposed soils. Seeded areas shall be checked regularly for bare spots, washouts, and healthy growth to assure that a good stand of grass is being maintained. Reseed areas that fail to establish vegetation cover as soon as such areas are identified.

3.2 DUST CONTROL

- A. In areas subject to surface and air movement of dust, where on-site or off-site damage is likely to occur, one or more of the following preventive measures shall be taken for dust control:
 - 1. Minimize the period of soil exposure through the use of temporary ground cover and other temporary stabilization practices.
 - 2. Sprinkle the site with water until surface is wet. Repeat as needed.

3.3 STRAW WATTLE OR ROLL

- A. Straw wattles shall be installed in accordance to manufacturer's installation guidelines.
- B. At a minimum:
 - 1. The wattle shall be entrenched and backfilled. A trench shall be excavated the width of the straw wattle and the length of the proposed barrier to a depth of 2-3 inches.
 - 2. Each wattle shall be securely anchored by at least one 18-24 inch stake every 3-4 feet and with a stake on each end. Stakes shall be driven perpendicular to slope face through the middle of the wattle until 2-3 inches remains exposed above the wattle.
 - 3. After the wattles are staked, compact excavated soil against the uphill side of the barrier.
 - 4. Adjacent wattles should tightly abut.

3.4 MAINTENANCE

- A. Inspection shall be frequent and repair or replacement shall be made promptly as needed. Straw bale carriers shall be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

END OF SECTION 023701
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FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 024100 - WASTE MATERIAL DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the loading, handling, hauling, and placing of excess excavation material, unsuitable excavation material, clearing and grubbing debris, and construction and demolition debris.

1.2 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Waste material disposal is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.1 WASTE MATERIAL TO BE HAULED TO A LANDFILL

- A. All demolition materials, garbage, and other refuse generated shall be removed from the project site and legally disposed of off Government property in an approved landfill.
- B. All stumps, slash and other clearing and grubbing debris shall be hauled to a landfill.
- C. The contractor is responsible for all costs and permits associated with landfill disposal.
- D. The Government is not responsible for waste material upon its departure from the project site.

END OF SECTION 024100
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FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, vapor barrier, placement procedures, and finishes.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Field quality-control test reports.
- D. Contraction and Expansion Joint Layout.

1.4 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. Structural 1, B-B or better; mill oiled and edge sealed.
 - b. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: Per structural drawings.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Deformed-Steel Wire: ASTM A 496.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type II.
- B. Normal-Weight Aggregates: ASTM C 33, graded, from a single source.
 1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Fly ash, ground iron blast-furnace slag, or silica fume shall partially replace cement in any mix as follows:
 1. Fly Ash:
 - a. Class C – Not more than 25 percent of the minimum mass of portland cement may be replaced with class C fly ash.
 2. Ground Iron Blast-Furnace Slag: Not more than 25 percent of the minimum mass of portland cement may be replaced with ground iron blast-furnace slag.
 3. Silica Fume (microsilica): Not more than 10 percent of the minimum mass of portland cement may be replaced with silica fume.
 4. Additionally, fly ash, slag, and silica fume will constitute no more than 50 percent of the total replacement weight. The goal for this project is to replace 25 percent of the total replacement weight.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Retarding Admixture: ASTM C 494/C 494M, Type B.

2.6 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.
 - 1. Basis of Design Product: Raven Industries, Vapor Block Plus 20 or approved equal.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch (9.5-mm) sieve, 10 to 30 percent passing a No. 100 (0.15-mm) sieve, and at least 5 percent passing No. 200 (0.075-mm) sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.
- C. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating or nondissipating. Liquid Membrane-Forming Compounds. Material shall be certified by curing compound manufacturer to not interfere with bonding of floor covering.

2.8 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.9 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings, Foundation Walls, Slabs-on-Grade: Proportion normal-weight concrete mixture as follows: Per the structural drawings unless noted otherwise.
 1. Slump Limit: 3-5 inch.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
 - D. Construct forms tight enough to prevent loss of concrete mortar.
 - E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
 - F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
 - G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
 - H. Chamfer or round exterior corners and edges of permanently exposed concrete.
 - I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
 - J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
 - K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
 - L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
- 3.2 EMBEDDED ITEMS
- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- 3.3 REMOVING AND REUSING FORMS
- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 48 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
 - B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
 - C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Contracting Officer.

3.4 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Contracting Officer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks. **No Sawed Joints are allowed on concrete exposed to freezing.**
- D. Expansion Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
 - 2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by the Contracting Officer.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

- A. As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- B. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane.
 2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm)
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Contracting Officer before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Contracting Officer. Remove and replace concrete that cannot be repaired and patched to Contracting Officer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete, but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes

- and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Contracting Officer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Contracting Officer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Contracting Officer's approval.
- 3.13 FIELD QUALITY CONTROL
- A. Testing and Inspecting: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample set for each truck of concrete (or portion thereof) delivered to the project. A composite sample set consists of three compressive test cylinders, one slump test, one air entrainment test, and one temperature test.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample. Perform additional tests when concrete consistency appears to change or water is added.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31/C 31M. Cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 - a. Compressive-Strength Tests: ASTM C 39/C 39M; test one of three laboratory-cured specimens at 7 days and one specimen at 28 days. If either previous tests fail, test third specimen at 28 days.
 - b. Strength of each batch delivered will be satisfactory if 28-day compressive-strength tests equals or exceeds specified compressive strength.
- C. Test results shall be reported in writing to Contracting Officer and Contractor within 48 hours of testing. Reports shall contain project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Correct deficiencies in the work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 033000
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 033510 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: This Section specifies polished concrete for the interior of the building.
- B. Related Sections:
 - 1. Section 033000 Cast-in-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 302.1R Guide for Concrete Floor and Slab Construction.
- B. ASTM International:
 - 1. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 2. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete.
 - 3. ASTM C779 Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
- C. National Floor Safety Institute (NFSI):
 - 1. NFSI Test Method 101-A Standard for Evaluating High-Traction Flooring Materials, Coatings, and Finishes.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide polished flooring that has been selected, manufactured and installed to achieve the following:
 - 1. Abrasion Resistance: ASTM C779, Method A, high resistance, no more than 0.008 inch (0.20 mm) wear in 30 minutes.
 - 2. Reflectivity: Increase of 35% as determined by standard gloss meter.
 - 3. Waterproof Properties: Rilem Test Method 11.4, 70% or greater reduction in absorption.
 - 4. High Traction Rating: NFSI 101-A, non-slip properties.
- B. Design Requirements:
 - 1. Hardened Concrete Properties:
 - a. As required by the structural plans.
 - 2. Placement Properties:
 - a. Natural concrete slump of 3 1/2 inches - Admixtures may be used.
 - 3. Hard-Steel Troweled (3 passes) Concrete: No burn marks. Finish to ACI 302.1R, Class 5 floor.
 - a. Class 6 floors, special colored mineral aggregate hardener with repeated hard steel trowel finish.
 - 4. Curing Options:
 - a. Membrane forming curing compounds (ASTM C309, Type 1, Class B, all resin, dissipating cure).
 - 1) Acrylic curing and sealing compounds not recommended.
 - b. Sheet membrane (ASTM C171); polyethylene film not recommended.

- c. Damp Curing: Seven day cure.

1.4 SUBMITTALS

A. Product Data:

1. Submit product data, including manufacturer's product sheets.
2. Material Safety Data Sheets (MSDS).
3. Preparation and concrete grinding procedures.

B. Quality Assurance:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties as cited in 1.3.A Performance Requirements.
2. Certificates:
 - a. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - b. Current contractor's certificate signed by manufacturer declaring contractor as an approved installer of polishing system.
3. Manufacturer's Instructions: Manufacturer's installation instructions.

C. Warranty: Submit warranty documents applicable to product.

D. Operation and Maintenance Data: Submit operation and maintenance data for installed products.

1. Include:
 - a. Manufacturer's instructions on maintenance renewal of applied treatments.
 - b. Protocols and product specifications for joint filing, crack repair and/or surface repair.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Installer with a minimum of 1 years' experience in performing work of this section who has specialized in installation of work similar to that required for this project.
2. Installer trained and holding a current certificate as a FGS PermaShine installer or approved equal.
3. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

B. Regulatory Requirements.

1. NFSI Test Method 101-A Phase Two Level High Traction Material.
2. Product finished shall be a specified level of cut to be:
 - a. Level 1 – Cream finish – polishing only the Portland Cement paste at the surface without exposing small, medium or large aggregate.
3. Used to show level of sheen when concrete is mechanically processed as outlined in 3.03 Installation.
 - a. Level A Sheen (satin) as determined by a gloss reading of 45 – 60

C. Preinstallation Meetings: Conduct a preinstallation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Meeting shall be used to coordinate the following:

1. Environmental requirements.
2. Scheduling and phasing of work.
3. Coordinating with other work and personnel. Remind all trades that they are working on a surface that is to become a finished surface.
4. Protection of adjacent surfaces.
5. Surface preparation.

6. Repair of defects and defective work prior to installation.
7. Cleaning.
8. Installation of polished floor finishes.
9. Application of liquid hardener, densifier.
10. Protection of finished surfaces after installation.
11. Do not place any materials on the concrete surface that may cause staining, etching or scratching.

1.6 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

1.7 DELIVERY, STORAGE & HANDLING

- A. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- B. Delivery:
 1. Deliver materials in manufacturer's original packaging with identification labels and seals intact.
- C. Storage and Protection:
 1. Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 2. Protect concrete slab.
 - a. Protect from petroleum stains during construction.
 - b. Diaper hydraulic power equipment.
 - c. Restrict vehicular parking.
 - d. Restrict use of pipe cutting machinery.
 - e. Restrict placement of reinforcing steel on slab.
 - f. Restrict use of acids or acidic detergents on slab.

1.8 SEQUENCING

- A. Sequence with Other Work: Comply with manufacturer's written recommendations for sequencing construction operations.

1.9 WARRANTY

- A. Project Warranty: Shall be a minimum of 10 years.
- B. Manufacturer's Warranty: Submit, for Government's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and does not limit, other rights Government may have under Contract Documents.

1.10 MAINTENANCE

- A. Comply with manufacturer's written instructions to maintain installed product.

PART 2 - PRODUCTS

2.1 POLISHED CONCRETE FINISHING PRODUCTS

- A. Basis of Design: Contractor shall supply the following product, or an approved equal for all products listed. All approved equals shall meet or exceed performance requirements of the Basis of Design product.
 1. Manufacturer: L & M Construction Chemicals, Inc. Local Representative: Alta Paints and Coatings 801-466-9625 or Smalley and Company 801-975-0672

- a. Contact: 14851 Calhoun Rd., Omaha, NE 68152-1140; Telephone: (800) 362-3331, (402) 453-6600; Fax: (402) 453-0244; website: www.LMCC.com, www.fgs-permashine.com; E-mail: info@lmcc.com.
2. Products/Systems:
 - a. Hardener, Sealer, Densifier: Proprietary, water based, odorless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film.
 - 1) Shall be L & M Construction Chemicals, Inc., FGS Hardener Plus or approved equal.
 - b. Joint Filler: Semi-rigid, 2-component, self-leveling, 100% solids, rapid curing, polyurea control joint and crack filler with Shore A 80 or higher hardness.
 - 1) Shall be L & M Construction Chemicals, Inc., Joint Tite 750 or approved equal.
 - c. Oil Repellent Sealer: Ready to use, silane, siloxane and fluoropolymers blended water based solution sealer, quick drying, low-odor, oil and water repellent, VOC compliant and compatible with chemically hardened floors.
 - 1) Shall be L & M Construction Chemicals, Inc., Petrotex, or approved equal.
 - d. Cleaning Solution: Proprietary, mild, highly concentrated liquid concrete cleaner and conditioner containing wetting and emulsifying agents; biodegradable, environmentally safe and certified High Traction by National Floor Safety Institute (NFSI).
 - 1) Shall be L & M Construction Chemicals, Inc., FGS Concrete Conditioner, or approved equal.
 - e. Color/Dye: L&M Vivid Dye: color to be selected from manufacturers full range of colors by contracting Officer's Representative.
 - f. Finish: Standard High gloss (HG-1), 1500 grit,

2.2 SOURCE QUALITY CONTROL

- A. Ensure concrete finishing components and materials are from single manufacturer.

PART 3 - EXECUTION

3.1 MANUFACTURERS INSTRUCTIONS

- A. Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalog installation instructions, and product carton installation instructions.

3.2 EXAMINATION

- A. Site Verification of Conditions:
 1. Verify that concrete substrate conditions, which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete finishing materials.
- B. Verify Concrete Slab Performance Requirements:
 1. Verify concrete is cured to 28 days
 2. Verify concrete surfaces received a hard steel-trowel finish (3 passes) during placement.
 3. Verify overall floor flatness is a minimum of Ff 40.

3.3 PREPARATION

- A. Ensure surfaces are clean and free of dirt and other foreign matter harmful to performance of concrete finishing materials.
- B. Examine surface to determine soundness of concrete for polishing.

- C. General Contractor to remove any surface contamination.

3.4 INSTALLATION

A. Floor Surface Polishing and Treatment:

1. Provide polished concrete floor treatment in entirety of slab indicated by drawings. Provide consistent finish in all contiguous areas.
2. Apply floor finish prior to installation of fixtures and accessories.
3. Diamond polish concrete floor surfaces with power disc machine as recommended by floor finish manufacturer. Sequence with coarse to fine grit. Installer to determine the optimum starting grit in order to achieve the specified aggregate exposure.
 - a. Comply with manufacturer's recommended polishing grits for each sequence to achieve desired finish level. Following the initial passes of metal bond diamonds, the installer shall drop back a minimum of one grit level when transitioning to resin bond diamonds. The separation in grit designation shall be a minimum of 50 for the transitioning step. The installer shall refine each abrasive grit to its fullest potential before moving on to the next level. Floor shall be thoroughly scrubbed between each grit pass to remove all loose material. Level of sheen shall match that of approved mock-up.
 - b. Expose aggregate in concrete surface only as determined by approved mock-up.
 - c. All concrete surfaces shall be as uniform in appearance as possible.
4. Apply FGS Hardener Plus, Hardener, Densifier as Follows: **Note: It is critical that two coats be applied**
 - a. First coat at 250 ft²/gal (6.25 m²/L), following the 400 grit level
 - b. Second coat at 350 ft²/gal (8.75 m²/L), prior to the final polishing pass
 - c. Follow manufacturer's recommendations for drying time between successive coats.
5. Remove defects and re-polish defective areas.
6. Finish edges of floor finish adjoining other materials in a clean and sharp manner.

3.5 ADJUSTMENTS

- A. Re-polish those areas not meeting specified gloss levels per mock-up.
- B. Fill joints flush to surface prior to the start of polishing operations

3.6 FINAL CLEANING

- A. Do cleanup in accordance with Section 017400 - Cleaning and Waste Management
- B. Upon completion, General Contractor must remove surplus and excess materials, rubbish, tools and equipment.

3.7 PROTECTION

- A. Protect installed product from damage during construction.
- B. Protect with EZ Cover™ by McTech Corp., or comparable product.
 1. Contact: Phone: (866) 913-8363; website: www.ezform.net.

END OF SECTION 033510
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION

SECTION 033545 - CONCRETE SIDEWALKS AND CURB & GUTTERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. This work shall consist of constructing concrete sidewalks and curb & gutter in accordance with the requirements of this specification and to the lines and dimensions as shown on the drawings and as staked in the field.
- B. Related Sections include the following:
 - 1. Section 321204 "Crushed aggregate Base" for preparing subgrade.
 - 2. Section 033000 "Cast-In-Place Concrete" for concrete and reinforcing.
 - 3. Section 312100 "Site Preparation and Grading" for preparation of subgrade
 - 4. Section 311000 "Clearing and Grubbing"
 - 5. Section 312000 "Earthwork" for construction of subgrade.

1.2 MEASUREMENT AND PAYMENT

- A. Concrete Sidewalk, Hardscape, Curb and Gutter – The quantity to be measured shall be lump sum for the completion of the concrete work onsite. Measurement and payment shall include clearing and grubbing, construction and compaction of the subgrade, crushed aggregate base, and concrete. Measurement shall include placement, finishing, and curing of the concrete. .

PART 2 - PRODUCTS

2.1 CONCRETE

- A. Concrete, reinforcement, expansion joint material and other concrete related items shall be in accordance with Section 033000 "Cast-in-Place Concrete."

2.2 JOINTS

- A. Construction joints shall be formed around all appurtenances, such as manholes, utility poles, etc., which extend into and through the ditches, curbs and gutters. Premolded expansion joint filler 1/2 inch thick shall be installed in these joints. Expansion joint filler shall be installed between concrete valley gutters, curbs and gutters and any fixed structure such as a building or bridge. This expansion joint material shall extend to the full depth of the concrete.
- B. Control joints shall be installed at maximum 5' on centers (for sidewalks) and 10' on centers (for curb & gutters), and expansion joint (1/2" felt) shall be installed at maximum 50' on centers.

2.3 CRUSHED AGGREGATE BASE

- A. Crushed aggregate base material shall be in accordance with section 321204 "Crushed Aggregate Base and Surface Course."

2.4 REINFORCING STEEL

- A. Reinforcing steel shall be No. 4 deformed billet steel bars in accordance with ASTM Specifications A-615 Grade 60.

PART 3 - EXECUTION

3.1 GENERAL

- A. The area for construction of the concrete sidewalks, slabs, curb & gutters, ditches, and waterways shall be cleared and grubbed in accordance with the drawings and specifications Section 311000 "Clearing and Grubbing."
- B. The subgrade shall be graded and shaped to required elevations for construction of the base course and concrete feature. Construction and compaction of subgrade shall be in accordance with specification section 312000 "Earthwork."
- C. The aggregate base course shall be constructed and compacted to the thickness shown on the drawings and in accordance with specifications section 321204 "Crushed Aggregate Base and Surface Course." Minimum thickness shall be 4 inches compacted depth unless noted otherwise.

3.2 COMPACTION

- A. Fill material and natural ground upon which the concrete will be placed shall be in accordance with Section 312225.

3.3 CONCRETE

- A. Placement, Finishing, Curing, and Protection shall be in accordance with Section 033000 "Cast In Place Concrete".

3.4 JOINTS

- A. The sidewalk shall be divided into sections by control joints formed by a jointing tool. The control joints shall extend into the concrete at least 1/4 of the depth. Joints shall match as nearly as possible adjacent joints in curb or pavements. Spacing of expansion joints with 1/2 inch thick pre-molded joint filler extending the full depth of the sidewalk shall not exceed 50 feet unless otherwise shown on the drawings.
- B. Construction joints shall be formed around all appurtenances, such as manholes, utility poles, etc., which extend into and through the sidewalks. Pre-molded expansion joint filler 1/2 inch thick shall be installed in these joints. Expansion joint filler shall be installed between concrete sidewalks and any fixed structure such as a building or bridge. This expansion joint material shall extend to the full depth of the walk.

3.5 FINISH GRADING AND CLEANUP

- A. Backfill and finish grade around ditches curbs and gutters. Finish grading shall be native soil material placed next to ditches curbs and gutters from top of surface sloped as shown on the drawings.
- B. When the installation has been completed, all debris and material not utilized shall be removed.

END OF SECTION 033545

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator and Testing Agency.
- B. Welding certificates.
- C. Product test reports for structural steel, including chemical and physical properties.
- D. Field quality-control and special inspection reports.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.6 MEASUREMENT AND PAYMENT:

- A. There will be no separate measurement or payment work in this section. Payment will be included in the contract unit price for items shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: Per structural drawings.
- B. Channels, Angles: Per structural drawings.
- C. Cold-Formed Hollow Structural Sections: Per structural drawings.
- D. Welding Electrodes: Use E70XX Electrodes. Comply with structural documents
- E. Sheet Steel for Planter Boxes: ASTM A588, Weathering Steel.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish where indicated on drawings.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH (ASTM A 563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers where indicated on drawings.
 - 1. Finish: Hot-dip zinc coating.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Anchor Rods: ASTM F1554 per Structural Drawings.
 - 1. Configuration: Hooked.
 - 2. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- E. Threaded Rods: ASTM A 36/A 36M.
 - 1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- F. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

2.3 PRIMER

- A. Primer: Comply with Section 099600 "High-Performance Coatings."

2.4 GROUT

- A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.

- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

- A. Bolts: Install bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

- 1. Joint Type: Snug tightened.

- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Contractor shall engage a qualified special inspector to perform the following special inspections per tables in structural drawings:

- B. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

- C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 Bolts."

- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

- 1. AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

- a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.

END OF SECTION 051200
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous steel framing and supports.
 - 2. Shelf angles.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Supports

1.3 MEASUREMENT AND PAYMENT:

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.2 COUNTER SUPPORTS:

- A. Basis of Design Product : Speed Brace by FastCap. Black
 - 1. 1000 lb load capacity

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless-steel fasteners for fastening aluminum.
 - 2. Provide stainless-steel fasteners for fastening stainless steel.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.

- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches from ends and corners of units and 24 inches o.c.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.

2.6 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to wood framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. .

2.7 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.8 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

2.9 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- B. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with unless zinc-rich primer is indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000
FEBURARY 2015

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Framing with engineered wood products.
 - 3. Wood blocking, and nailers.
 - 4. Wood furring and grounds.
 - 5. Wood sleepers.
 - 6. Utility shelving.
 - 7. Plywood backing panels.
- B. Related Sections include the following:
 - 1. Division 06 Section "Sheathing."

1.2 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. WCLIB: West Coast Lumber Inspection Bureau.
 - 5. WWPA: Western Wood Products Association.

1.3 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- C. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Wood-preservative-treated wood.
 - 2. Engineered wood products.
 - 3. Power-driven fasteners.
 - 4. Power-actuated fasteners.
 - 5. Expansion anchors.
 - 6. Metal framing anchors.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

1.6 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated on drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPAC31 with inorganic boron (SBX).
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 15 percent.
- B. Non-Load-Bearing Interior Partitions: Standard, Stud grade of any species indicated below.
 1. Hem-fir (north); NLGA.
 2. Spruce-pine-fir; NLGA.
 3. Hem-fir; WCLIB, or WWP.
 4. Northern species; NLGA.
- C. Exterior and Load-Bearing Walls: Posts and trimmers to be as required by the structural drawings
 1. Douglas fir-larch; WCLIB or WWP.
 2. Douglas fir-south; WWP.
 3. Douglas fir-larch (north); NLGA.
- D. Framing Other Than Non-Load-Bearing Interior Partitions: As noted in the structural plans
- E. Joists, Rafters, and Other Framing Not Listed Above: Construction or No. 2 grade as noted in the structural plans and any of the following species:
 1. Douglas fir-larch; WCLIB or WWP.
 2. Douglas fir-larch (north); NLGA.
- F. Joists, Rafters, and Other Framing Not Listed Above: As required by structural plans

2.4 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Boise Cascade Corporation.
 - b. Finforest USA.
 - c. Georgia-Pacific.
 - d. Louisiana-Pacific Corporation.
 - e. Pacific Woodtech Corporation.
 - f. Roseburg Forest Products Co.
 - g. Weldwood of Canada Limited; Subsidiary of International Paper Corporation.
 - h. Weyerhaeuser Company.
 2. Extreme Fiber Stress in Bending: As noted in structural plans.
 3. Modulus of Elasticity, Edgewise: As noted in structural plans.
- B. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559 and containing no urea formaldehyde.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Weyerhaeuser Company.

2. Extreme Fiber Stress in Bending, Edgewise: As noted in structural plans.
3. Modulus of Elasticity, Edgewise: As noted in structural plans.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following, where indicated or required:
 1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Furring.
 5. Grounds.
- B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 15 percent maximum moisture content and any of the following species:
 1. Hem-fir (north); NLGA.
 2. Hem-fir; WCLIB, or WWPA.
 3. Northern species; NLGA.
- C. For exposed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
 1. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 2. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
- D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Requirements for fasteners are shown in the structural plans.

2.8 METAL FRAMING ANCHORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Alpine Engineered Products, Inc.
 2. Cleveland Steel Specialty Co.
 3. Harlen Metal Products, Inc.
 4. KC Metals Products, Inc.
 5. Simpson Strong-Tie Co., Inc.

6. Southeastern Metals Manufacturing Co., Inc.
 7. USP Structural Connectors.
 8. Approved Equal.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
 - C. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - D. Joist Hangers: U-shaped joist hangers as indicated on Drawings.
 - E. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
 1. As indicated on Drawings
 - F. Post Bases: as indicated on Drawings.
 - G. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports as indicated on Drawings.
 - H. Rafter Tie-Downs: As indicated on Drawings.
 - I. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, as indicated on Drawings. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.
 - J. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
 1. As indicated on Drawings.
- 2.9 MISCELLANEOUS MATERIALS
- A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
 - B. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch.
 - C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

- E. Do not splice structural members between supports, unless otherwise indicated.
 - F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
 - G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
 - H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
 - I. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
 - J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table 23-II-B-1, "Nailing Schedule," and Table 23-II-B-2, "Wood Structural Panel Roof Sheathing Nailing Schedule," in ICBO's Uniform Building Code.
 - K. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.
 - L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with indicated fastener patterns where applicable.
 - 2. Use finishing nails, unless otherwise indicated. Indicate locations of other fasteners, such as wood screws, bolts, and lag screws, on Drawings.
- 3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION
- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
 - B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
 - C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Fibercement Lap and Vertical Siding and Metal Siding: Install 1-by-3-inch nominal-size furring vertically at 16 inches o.c., in line with interior stud wall.

3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction, unless otherwise indicated.
 - 1. For exterior walls, provide 2-by-6-inch nominal- size wood studs spaced 16 inches o.c., unless otherwise indicated.
 - 2. For interior partitions and walls, provide 2-by-6-inch nominal- and 2-by-4-inch nominal- size wood studs spaced 16 inches o.c., unless otherwise indicated.
 - 3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
 - 1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
 - 2. For load-bearing walls, see requirements as indicated on Drawings.

3.5 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 061500 – TONGUE AND GROOVE WOOD CEILING AND SOFFIT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: T&G wood ceilings and soffits.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of wood decking to avoid extended on-site storage and to avoid delaying the Work.

1.4 MEASUREMENT AND PAYMENT:

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 WOOD DECKING, GENERAL

- A. Moisture Content: Provide wood decking with 19 percent maximum moisture content at time of dressing.

2.2 WOOD DECKING

- A. Basis of Design Product: Species and Grade noted below available from: Bear Creek Lumber, Inc. 495 Twisp/ Withrop Eastside Road POB 669 Winthrop WA 98862 or from an approved equal
- B. Species:
 - 1. Douglas fir-larch or Douglas fir-larch, C/D & Better Clear.
- C. Decking Nominal Size: 1X6 (9/16" x 5" Nominal), tongue with V groove.
- D. Face Surface and Edge Pattern: Smooth face, smooth grooved.

2.3 ACCESSORY MATERIALS

- A. Fastener Material: Hot-dip galvanized steel.
- B. Sealant: Latex sealant compatible with substrates.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install solid-sawn wood to stagger joints and end at joist supports.
 - 1. Locate end joints for combination simple and two-span continuous lay-up.
- B. Anchor wood ceiling/soffit, where supported on walls, with finish screws as indicated on drawings.
- C. Apply joint sealant to seal material at exterior walls at the following locations:
 - 1. Between wood and supports located at exterior walls.
 - 2. Between wood and exterior walls that butt against underside of decking.
 - 3. Between tongues and grooves of decking over exterior walls and supports at exterior walls.

- D. Provide temporary waterproof covering as the Work progresses to protect roof decking until roofing is applied.

END OF SECTION 061500

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Roof sheathing.
 - 2. Wall sheathing.
 - 3. Building Wrap.
 - 4. Building Paper.
 - 5. Flexible flashing at openings in sheathing.
- B. Related Sections include the following:
 - 1. Division 06 Section "Rough Carpentry" for exterior plywood sheathing and interior plywood backing panels.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Building wrap.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

1.4 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. In accordance with structural drawings.

2.2 ROOF SHEATHING

- A. In accordance with structural drawings.

2.3 WALL SHEATHING

- A. In accordance with structural drawings.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

- B. Power-Driven Fasteners: NES NER-272.
- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For steel framing less than 0.0329 inch thick, attach sheathing to comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, attach sheathing to comply with ASTM C 954.

2.5 WEATHER-RESISTANT SHEATHING PAPER

- A. Building Paper, where indicated: ASTM D 226, Type 1 (No. 30 asphalt-saturated organic felt), unperforated.
- B. Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
 - b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
 - c. Pactiv, Inc.; GreenGuard Ultra Wrap.
 - d. Raven Industries Inc.; Rufco-Wrap.
 - 2. Water-Vapor Permeance: Manufacturer's standard, or not less than 63 g through 1 sq. m of surface in 24 hours per ASTM E 96, Desiccant Method (Procedure A).
 - 3. Allowable UV Exposure Time: Not less than three months.
- C. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. In accordance with the structural drawings
- D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:
 - a. Nail to wood framing as indicated on Drawings.
 - b. Space panels 1/8 inch apart at edges and ends.

3.3 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

- A. General: Cover sheathing with weather-resistant sheathing paper as follows:
 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap, unless otherwise indicated.
- B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.
- C. Building Wrap: Comply with manufacturer's written instructions.
 1. Seal seams, edges, fasteners, and penetrations with tape.
 2. Extend into jambs of openings and seal corners with tape.

3.4 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing at all openings to comply with manufacturers written instructions.
 1. Prime substrates as recommended by flashing manufacturer.
 2. Lap seams and junctures with other materials at least 4 inches, except that at flashing flanges of other construction, laps need not exceed flange width.
 3. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 4. Lap weather-resistant building paper over flashing at heads of openings.
 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 061600
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Interior frames and jambs.
 - 3. Plastic laminate faced wood cabinets.
 - 4. Solid-surfacing-material countertops.
 - 5. Shop finishing of woodwork.
 - 6. Closet and utility shelving.
- B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

- A. Product Data: For solid-surfacing material, laminate, cabinet hardware and accessories, and finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples for Initial Selection and Verification:
 - 1. Lumber with finish, not less than 50 sq. in., for each species and cut, finished on 1 side and 1 edge.
 - 2. Solid-surfacing materials, 6 inches square.
 - 3. Plastic Laminate material, 6 inches square, minimum 10 each for selection.
- D. Qualification Data: For Installer and fabricator.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species and Cut for Transparent Finish: As indicated in the drawing.
- C. Lumber Trim for Transparent Stained and Painted Applications: solid lumber with smooth face and of the following species and grade:
 - 1. Wood Base: Grade (Quality) 1 X 6 Hickory.
 - 2. Window trim: 1 X 4 Douglas fir clear to match windows. Submit sample for approval after window delivery.
- D. Wood Products: Comply with the following:
 - 1. Hardboard: AHA A135.4.
 - 2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
 - 3. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
- E. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1. For cabinet interiors only
 - 1. Provide PVC or polyester edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.
- F. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Basis of Design Product: Wilsonart "Cocoa line" Y0608 or as selected by COR from full Wilson Art line.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
 - a. Abet Laminati, Inc.
 - b. Arborite; Division of ITW Canada, Inc.
 - c. Formica Corporation.
 - d. Lamin-Art, Inc.
 - e. Nevamar Company, LLC; Decorative Products Div.
 - f. Panolam Industries International Incorporated.
 - g. Westinghouse Electric Corp.; Specialty Products Div.
 - h. Wilsonart International; Div. of Premark International, Inc.
- G. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
 - 1. Basis of Design: Dupont Corian, or approved equal

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABA Industries.
 - b. Avonite, Inc.
 - c. E. I. du Pont de Nemours and Company.
 - d. Formica Corporation.
 - e. LG Chemical, Ltd.
 - f. Meganite Inc.; a division of the Pyrochem Group.
 - g. Nevamar Company, LLC; Decorative Products Div.
 - h. Samsung; Cheil Industries Inc.
 - i. Swan Corporation (The).
 - j. Transolid, Inc.
 - k. Wilsonart International; Div. of Premark International, Inc.
3. Type: Standard type.
4. Colors and Patterns: Corian – color: “Silver Birch” or as selected by Contracting Officer from manufacturer's full range of similar price point.
5. Solid-Surfacing-Material Minimum Thickness: 1/2 inch.
6. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
7. Fabricate tops with shop-applied edges of materials and configuration indicated.
8. Fabricate tops with loose backsplashes for field application

2.2 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in this Section
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- C. Wire Pulls: Back mounted, solid metal, 5 inches long, 2-1/2 inches deep, and 5/16 inch in diameter.
- D. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, or B04081 BHMA A156.9, B04102; with shelf brackets, B04112.
- E. Shelf Rests: BHMA A156.9, B04013; metal.
- F. Drawer Slides: BHMA A156.9, B05091.
 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
- G. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 1. Satin Stainless Steel: BHMA 630.
- H. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom-grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members 3/4 Inch Thick or Less: 1/16 inch.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 1. Seal edges of openings in countertops with a coat of varnish.

2.5 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Grade: Custom.
- B. Type of Construction: Frameless.
- C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- D. Reveal Dimension: 1/2 inch.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Lamin-Art, Inc.
 - d. Pionite: a Panolam Industries International, Inc. brand.
 - e. Wilsonart International Holdings, Inc.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS.
 - 2. Postformed Surfaces: Grade HGP.
 - 3. Vertical Surfaces: Grade HGS.
 - 4. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels Horizontally for drawer fronts, doors, and fixed panels.
- G. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
 - 2. Drawer Sides and Backs: Solid-hardwood lumber.
 - 3. Drawer Bottoms: Hardwood plywood.
- H. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.

- I. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by COR from laminate manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
 - b. Patterns, matte finish.

2.6 CLOSET AND UTILITY SHELVING

- A. As shown on drawing
- B. Shelf Material: 3/4-inch plastic laminate veneer-faced panel product with PVC edge banding.
- C. Cleats: 3/4-inch (19-mm) solid lumber.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches (2400 mm) long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
 - 2. Install wall railings on indicated metal brackets securely fastened to wall framing.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 - 2. Maintain veneer sequence matching of cabinets with transparent finish.

3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips.
- H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
 3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. for laminate countertops and to walls with adhesive for solid-surfacing countertops.
 4. Calk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants."
- I. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Cold-applied, emulsified-asphalt dampproofing.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

1.5 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ChemMasters Corp.
 - 2. Degussa Building Systems; Sonneborn Brand Products.
 - 3. Gardner Gibson, Inc.
 - 4. Henry Company.
 - 5. Karnak Corporation.
 - 6. Koppers Inc.
 - 7. Malarkey Roofing Products.
 - 8. Meadows, W. R., Inc.
 - 9. Tamms Industries, Inc.
- B. Trowel Coats: ASTM D 1227, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.2 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

- B. Patching Compound: Epoxy or latex-modified repair mortar of type recommended by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.
 - 1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.
 - 2. Test for surface moisture according to ASTM D 4263.

3.2 PREPARATION

- A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.
- C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
 - 1. Apply additional coats if recommended by manufacturer or if required to achieve coverages indicated.
 - 2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.
 - 3. Allow 24 hours drying time prior to backfilling.
- B. Apply dampproofing to footings and foundation walls where opposite side of wall faces building interior. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing.
 - 1. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Concrete Foundation Walls: Apply 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, 1 fibered brush or spray coat at not less than 3 gal./100 sq. ft. or 1 trowel coat at not less than 4 gal./100 sq. ft.

3.5 CLEANING

- A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 071113

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. High Density Spray Foam Polyurethane insulation.
 - 2. Fiberglass batt building insulation for sound proofing.
 - 3. Blown in blanket fiberglass insulation.
 - 4. Rigid Thermal Insulation Board

1.2 DEFINITIONS

- A. Mineral-Fiber Insulation: Insulation composed of glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.3 PERFORMANCE REQUIREMENTS

- A. Mold Growth and Humidity Test Results: Insulation shows no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with *Chaetomium globosum* on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price as shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

- A. Available Manufacturers:
 - 1. CertainTeed Corporation.

2. Guardian Fiberglass, Inc.
 3. Johns Manville.
 4. Knauf Fiber Glass.
 5. Owens Corning.
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- C. Where glass-fiber blanket insulation is indicated on the drawings and wall types, provide sound batt insulation in roll form to fill the full 2x4 or 2x6 wall thicknesses.
- 2.2 SPRAY-IN-PLACE POLYURETHANE INSULATION
- A. Available Manufacturers:
1. Small area portable spray foam kit for doors, windows closed cell by www.sprayfoamkit.com Foam it Green. For interstitial areas.
- B. Polyisocyanurate Spray Foam Insulation Systems shall be applied by qualified, experienced spray applicators.
1. Basis of Design Product – BASF Spraytite 178 closed-cell polyurethane foam insulation and air barrier or approved equal.
 - a. R-6.8 R-Value per inch, 2" thick
 - b. Air Leakage <0.001 l/s/m² @ 75 Pa at 1.5" thickness
- 2.3 Blown in blanket fiberglass insulation
- A. Available Manufacturers:
1. Certaineed: Optima or insulsafe fibers
 2. Johns Manville : ClimatePro
- B. Fabric: Polypropylene Non-Woven fabric, 30 gram, white SBPP Fabric
- 2.4 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD
- A. Extruded polystyrene boards in this article are also called "XPS boards."
- B. Extruded Polystyrene Board, Type X: ASTM C 578, Type X, 15-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
1. 2" thick
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 3. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following: Basis of Design: Foamular by Owens Corning or approved equal
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Approved equal.
- C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly
- 2.5 AUXILIARY INSULATING MATERIALS
- A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- E. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Install fiber insulation in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures.
 - 4. Install between floor framing members in crawlspace.
 - 5. For wood-framed construction, install mineral-fiber blankets according to ASTM C 1320.
- C. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.
- D. Blown in blanket (BIBBS): Install in accordance with manufacturer recommendations.
- E. Sprayed Polyurethane installation:
 - 1. Substrate Preparation:
 - a. For optimum results, surfaces to receive polyurethane insulation should be clean and dry, free of dirt, oil, loose particles, frost, moisture, and other foreign matter. Primers are rarely used but should be incorporated as follows:
 - 1) Plywood, OSB, Structural Lumber; substrates shall be dry and free from contaminants, moisture, frost, and shall not have a moisture content above 15%. Generally a primer for these surfaces is not required. Heating and drying these

surfaces during winter conditions generally brings these substrates into compliance. If a primer is required it shall be Acryprime – Substrate as manufactured by Resin Technology or equal.

2. Polyurethane Foam Insulation Application:

- a. Apply Spray Foam Polyurethane Insulation or equal in 2 x 6 constructed walls, and on underside of roof sheathing. Refer to drawings for proper foam insulation thickness requirements.
- b. Special care shall be taken to seal all penetrations of conduit, piping, coax, romex and other obstructions within the wall or ceiling areas where they pass from wall or ceiling cavity to the next cavity. Dead corners or blocked out framing areas shall be drilled and foam-filled to eliminate “hot/cold spots”. Areas of excessive blocked out areas shall be reported to the General Contractor for correction.
- c. Follow manufacturers recommended procedures for temperatures and preparation of substrates.

3.5 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.6 INSULATION SCHEDULE

- A. As shown on the Drawings.

END OF SECTION 072100
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes standing-seam metal roof panels.

1.2 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at the Flaming Gorge Ranger District Office
 - 1. Meet with COR, panel installer, carpenter, and any trades whose work interfaces with or effects metal panels, including installers of roof accessories and roof-penetrations.
 - 2. Review and finalize construction schedule and verify availability of materials, personnel, equipment, and facilities needed to make progress and avoid delays.
 - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
 - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
 - 5. Review flashings, special details, drainage, penetrations and condition of other construction that affect metal panels.
 - 6. Review temporary protection requirements for metal panel systems during and after installation.
 - 7. Review procedures for repair of metal panels damaged after installation.
 - 8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 3 inches per 12 inches (1:5).
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
 - 1. Include similar samples of trim and accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Manufacturer and Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in architectural sheet metal products.
- B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof area and eave, including fascia, as shown on Drawings; approximately 48 inches square by full thickness, including attachments, underlayment, and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless COR specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels until installation. Remove as panels are being installed. Verify film is not left on installed panels.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate sizes and locations roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Watertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain watertight, including leaks, within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
 - 2. Shop drawings must be provided to, reviewed, and approved by panel manufacturer prior to panel system installation.
 - 3. Inspections by panel system manufacturer technical representative are required. Perform first inspection when underlayment and flashing are in place and second inspection when the roof is complete.
- B. Special Installer Warranty: Furnish a written warranty signed by the Panel Applicator guaranteeing materials and workmanship for watertightness of the roofing system, flashings, penetrations, and against all leaks.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Batten Seamed Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and a flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of the panels, aligning vertical ribs and snapping on batten seam cap.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide **Berridge Manufacturing Company; Tee-Panel** or approved equal.
 - 2. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.024 inch
 - b. Exterior Finish: Two-coat fluoropolymer.
 - c. Painted materials shall have a removable plastic film to protect the paint during roll forming, shipping and handling.
 - d. Color: As selected by COR from full line.

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 40 mils (1.02 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 - 1. Basis of Design: Grace Ice and Water Shield or approved equal.

2.3 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Panel Fasteners: Zinc-coated steel, corrosion resisting steel, zinc cast head, or nylon capped steel, type and size as approved for the applicable loading requirements.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Joint Sealant: Silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using factory set, non-adjustable, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 - 3. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat applied by panel manufacturer on a continuous coil coating line, with a top side dry film thickness of 0.75 ± 0.05 mil (0.0013 mm) over 0.2 ± 0.05 mil (0.0013 mm) primer coat, to provide a total dry film thickness of 0.95 ± 0.10 mil (0.024 mm). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.35 mil (0.009 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 - 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.

- a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 36 inches. Roll laps with roller. Cover underlayment within 14 days or as directed by the underlayment product manufacturer.
 - 1. Apply over the entire roof surface.
- B. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal panels to be level to 1/4 inch in 20 ft..
 - 2. Flash and seal metal panels at perimeter of all openings. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 - 3. Locate and space fastenings in uniform vertical and horizontal alignment.
 - 4. Install flashing and trim as metal panel work proceeds.
 - 5. Panels should be continuous without end laps.
 - 6. Align bottoms of metal panels and fasten.
 - 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
- E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
 - 1. Install clips to supports with self-tapping fasteners.
 - 2. Install pressure plates, if required, at locations indicated in manufacturer's written installation instructions.
 - 3. Batten Seam Joint: Nest standing seams and fasten together by installing batten seam cap and completely engage factory-applied vinyl weatherseal.
- F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

- G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 - 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 074213.13 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concealed fastener, lapped seam weathered steel wall panels.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Warranties: Samples of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

1.8 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.

- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 PANEL MATERIALS:

- A. Metallic Coated Sheet Steel: Restricted flatness steel sheet metallic coated by the hot dipped process and pre-painted by the coil coating process to comply with ASTM A 755A/ A 755M

1. Zinc Coated Sheet Steel: ASTM A 653/A 653 M, G90 coating designation; structural quality.
2. Surface, flat finish
3. Exposed Coil Coated Finish:
 - a. AZP Corten Fluoropolymer: AAMA 621: Fluoropolymer finish not containing less than 70 percent PVDF resin by weight in color and clear coats. Prepare, pretreat and apply coating to exposed metal surfaces to comply with coating manufacturers written instructions.

- B. Panel Sealants:

1. Sealant Tape: Pressure sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release paper backing. Provide permanently elastic, non-sag, nontoxic nonstaining tape, ½” wide and 1/8” thick.
2. Joint Sealant: ASTM C920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class and use classification required to seal joints

2.3 CONCEALED FASTENER, LAP SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

- B. Flush profile, concealed Fastener Metal Wall Panels: Formed with vertical panel edges and flat pan between panel edges alternating curved ribs spaced at 2.67 inches o.c. across width of panel.

1. Basis of Design Product: Kovach Inc Architectural shingle: 16” high 24” wide or comparable product
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Kovach
 - b. ATAS International
3. Material: Zinc Coated galvanized steel steel 0.040 inch nominal thickness.
4. Exterior Finish: AZP Corten fluoropolymer coating system

2.4 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

2.6 FINISHES

- A. Panels and Accessories:
 - 1. Weathering Steel panels.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 METAL PANEL INSTALLATION

- A. Watertight Installation:
 - 1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels; and elsewhere as needed to make panels watertight.
 - 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - 3. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.
- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074213
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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 074570 - CEMENTITIOUS PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cementitious express/reveal jointed panel with accessories.

1.2 RELATED SECTIONS

- A. Section 06100 – Rough Carpentry: Wood framing and bracing.
- B. Section 06100 – Rough Carpentry: Sheathing.
- C. Section 07210 – Insulation: Exterior wall insulation.

1.3 REFERENCES

A. ASTM International (ASTM):

1. ASTM B136 - Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum.
2. ASTM B244 - Standard Test Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic Basis Metals with Eddy-Current Instruments.
3. ASTM C834 - Standard Specification for Latex Sealants.
4. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
5. ASTM C1186 - Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets.
6. ASTM D523 - Standard Test Method for Specular Gloss.
7. ASTM D1117 - Standard Guide for Evaluating Nonwoven Fabrics.
8. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
9. ASTM D1730 - Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting.
10. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
11. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test.
12. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test.
13. ASTM D4585 - Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
14. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
15. ASTM E96 - Test Methods for Water Vapor Transmission of Materials.
16. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
17. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
18. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure

- B. AATCC127 - Water Resistance: Hydrostatic Pressure Test.

- C. TAPPI – T460 - Air Resistance of Paper (Gurley Method).

1.4 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Installation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Manufacturer's best practice guide.
 - 4. Technical data sheet.
 - 5. Standard CAD drawings
- B. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cladding junctions and penetrations which are outside the scope of the standard details and specifications provided by the manufacturer.
- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. Manufacturer's Warranty: Provide Panel Limited Product Warranty, with 30-year limited product warranty against manufacturing defects.
 - 1. Application Warranty: Application limited warranty for 2 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: James Hardie Building Products, Inc., which is located at: 231 South LaSalle Street Unit 2000, Chicago, IL 60606. ASD. Toll Free Tel: 866-274-3464; Web: <http://www.jameshardiepros.com/Products/Hardie-Reveal-Panel-System> or approved equal

2.2 CLADDING

- A. Cement Cladding Panels: Hardie Reveal Panel as manufactured by James Hardie Building Products, Inc. 7/16 inches thick, 3 feet 11.5 inches (1206 mm) wide by 7 feet 11.5 inches (2426 mm) long.
 - 1. Manufacturer's Climate Zone Product: HZ5 for freezing wet climates with a green tint primer.
- B. Code Compliance Requirement for Siding Materials:
 - 1. Fiber-cement siding, complies with ASTM C 1186 Type A Grade II.
 - 2. Fiber-cement siding, complies with ASTM E 136 as a noncombustible material.
 - 3. Fiber-cement siding, complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
 - 4. Fiber-cement siding, complies with ASTM E 119 1 hour and 2 hour fire resistive assemblies listed with Warnock Hersey.
 - 5. Fiber-cement siding, tested to ASTM E330 for Transverse Loads.
 - 6. Intertek Warnock Hersey Product Listing.
 - 7. Manufacturer's Technical Data Sheet.

2.3 ACCESSORIES

- A. Trims: Trims manufactured by Custom Aluminum of Elgin, IL or approved equal in the following profiles. Aluminum alloy 6063-T5 with a minimum thickness of 0.050 inch. All reveal trims are 8 feet in length.
 - 1. Surround horizontal trim.
 - 2. Surround vertical trim.
 - 3. Surround horizontal end cut transition trim.
 - 4. Surround outside corner trim.
 - 5. Surround inside corner trim.
 - 6. Surround J channel trim.
 - 7. Surround drainage flashing.
 - 8. Recess horizontal trim.
 - 9. Recess vertical trim.
 - 10. Recess horizontal edge trim.
 - 11. Recess vertical F-trim.
 - 12. Recess outside corner trim.
 - 13. Recess drainage flashing.
- B. Finishes of Reveal Trims:
 - 1. Clear anodized; conforming to ASTM B244 and ASTM B136.

2.4 FASTENERS

- A. Fasteners: For attaching Panel direct to sheathing to a rain screen provide the following:
 - 1. Wood Framing, Exposed Screws: No. 10 by 0.472 inch head diameter by 1.5 inch long.

2.5 FINISHES

- A. Factory Primer: Provide factory applied universal primer.
 - 1. Primer: Factory applied sealer/primer by manufacturer. Apply flat sheen finishes to panels.
 - 2. Topcoat: Refer to Section 09 Paint specs for final finish
- B. Factory Finish for Trim:
 - 1. Trim for Factory-Applied Finish and No Field-Applied Finish: Clear anodized.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If framing preparation is the responsibility of another installer, notify COR of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Ensure that drainage plane is intact and all penetrations are sealed.

3.3 INSTALLATION

- A. Minimum 1-1/2 inches (38 mm) face and straight, true, of uniform dimensions and properly aligned.
 - 1. Install water-resistive barriers and claddings to dry surfaces.
 - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
 - 3. Protect siding from other trades.
- B. Furring: Install furring on a minimum 3/4 inch rain screen cavity as shown in drawings.
- C. Installation: Install materials in strict accordance with manufacturer's installation instructions.
 - 1. Fastening Method: Exposed.
 - 2. Place fasteners no closer than 3/4 inch from panel edges and 2 inches from panel corners.
 - 3. Use fasteners as specified in the manufacturer's Tech Data sheet and Panel Installation Instructions.
 - 4. Install panel using 1/2 inch spacers at horizontal joints. Leave bottom edge of panel above all horizontal trims exposed, no caulking shall be placed at this overlap of trim. Factory primed edge shall always be used.
 - 5. Allow minimum vertical clearance between the bottom edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
 - 6. Maintain clearance between siding and adjacent finished grade.

3.4 FINISHING

- A. See paint specification.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 074570
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following sheet metal flashing and trim:
 - 1. Formed steep-slope roof sheet metal fabrications.
 - 2. Formed sheet metal fabricated flashing around doors, windows and other locations.
- B. Related Sections include the following:
 - 1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Division 6 Section "Siding" for flashing and trim furnished and installed by Division 6.
 - 3. Division 07 Section "Sheet Metal Roofing" for custom-formed sheet metal flashing and trim and rain gutters and downspouts integral with sheet metal roofing.
 - 4. Division 7 Section "Joint Sealants" for field-applied sheet metal flashing and trim sealants.

1.2 PERFORMANCE REQUIREMENTS

- A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.
- B. Fabricate and install flashing capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
 - 1. Wind Zone 1: For velocity pressures of 21 to 30 lbf/sq. ft.: 60-lbf/sq. ft. perimeter uplift force, 90-lbf/sq. ft. corner uplift force, and 30-lbf/sq. ft. outward force.
- C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For each type of sheet metal flashing and trim indicated with factory-applied color finishes.
 - 1. Include similar Samples of trim and accessories involving color selection.

1.4 QUALITY ASSURANCE

- A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual." Conform to dimensions and profiles shown unless more stringent requirements are indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.6 COORDINATION

- A. Coordinate installation of sheet metal fascia, flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
 - 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; structural quality.
 - 3. Surface: Smooth, flat.
 - 4. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 5. Color: As selected by Contracting Officer from manufacturer's full range.
 - 6. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 UNDERLAYMENT MATERIALS (Select from the following as indicated or required)

- A. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
- B. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
- C. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.

- b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
- c. Henry Company; Blueskin PE200 HT.
- d. Metal-Fab Manufacturing, LLC; MetShield.
- e. Owens Corning; WeatherLock Metal High Temperature Underlayment.
- f. Approved equal.

D. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
 - 1. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.
- C. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.
- E. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- F. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal fascia, flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
 - 1. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.
- E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric butyl sealant concealed within joints.
- F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
 - 1. Thickness: As recommended by SMACNA's "Architectural Sheet Metal Manual" and FMG Loss Prevention Data Sheet 1-49 for application but not less than thickness of metal being secured.

2.5 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- B. Counterflashing: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- C. Flashing Receivers: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.
- D. Roof-Penetration Flashing: Fabricate from the following materials:
 - 1. Prefinished Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.6 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction, where indicated or required: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
 - 1. Prefinished Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.

2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.
 - 1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene underlayment.
 2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.
- C. Install exposed sheet metal flashing and trim without oil canning, buckling, and tool marks.
- D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric butyl sealant.
- E. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
- F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric butyl sealant concealed within joints.
- G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
1. Galvanized or Prepainted, Metallic-Coated Steel: Use stainless-steel fasteners.
- H. Seal joints with elastomeric butyl sealant as required for watertight construction.
1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.
- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for butyl sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant.
1. Secure in a waterproof manner by means of snap-in installation and sealant or interlocking folded seam or blind rivets and sealant or anchor and washer at 36-inch centers.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:
1. Turn lead flashing down inside vent piping, being careful not to block vent piping with flashing.
 2. Seal with butyl sealant and clamp flashing to pipes penetrating roof except for lead flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.5 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with butyl sealant to equipment support member.

3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes the following, where indicated or required:
 - 1. Silicone joint sealants.
 - 2. Latex joint sealants.
- B. Related Sections:
 - 1. Division 08 Section "Glazing" for glazing sealants.
 - 2. Division 09 Section "Gypsum Board" for sealing perimeter joints.

1.2 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.

1.3 QUALITY ASSURANCE

Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.4 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.5 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- D. Colors of Exposed Joint Sealants: As selected by Contracting Officer from manufacturer's full range.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- B. Available Products: Subject to compliance with requirements, joint sealant schedule, and manufacturer's recommendations, provide one of the products specified in each category below where needed:
 - 1. Elastomeric Joint Sealant Designation: ES4
 - a. Base Polymer: Acid-curing silicone.
 - b. Type: S (single component).
 - c. Grade: NS (nonsag).
 - d. Class: 25.
 - e. Additional Movement Capability: 25 percent movement in extension and 25 percent in compression for a total of 50 percent movement.
 - f. Use[s] Related to Exposure: NT (nontraffic).
 - g. Uses Related to Joint Substrates: G (glass), A (aluminum) and, as applicable to joint substrates indicated, O (other).
 - h. Products:
 - 1) Dow Corning 999-A
 - 2) GE Contractors 1200
 - 3) Pecora 863
 - 4) Tremco Tremsil 300
 - 5) Approved equal
 - 2. Elastomeric Joint Sealant Designation: ES5
 - a. Base Polymer: Acid-curing, mildew-resistant silicone.
 - b. Type: S (single component).
 - c. Grade: NS (nonsag).
 - d. Class: 25.
 - e. Additional Movement Capability: 25 percent movement in extension and 25 percent in compression for a total of 50 percent movement.
 - f. Use[s] Related to Exposure: NT (nontraffic).
 - g. Uses Related to Joint Substrates: G (glass), A (aluminum) and, as applicable to joint substrates indicated, O (other).
 - h. Products:
 - 1) Dow Corning - Trademate Tile and Ceramic
 - 2) GE - Sanitary 1700
 - 3) Tremco - Tremsil 600
 - 4) Approved equal

2.3 LATEX JOINT SEALANTS

- A. General: For interior locations only and where movement capacity and weathering characteristics are not critical, provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of either acrylic or silicone emulsion formulation indicated that is recommended for exposed applications on interior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.
- B. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.
- C. Available Products: Subject to compliance with requirements, latex joint sealants that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Latex Joint Sealant Designation: LS1

- a. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- b. Products:
 - 1) "AC-20," Pecora Corp.
 - 2) "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
 - 3) "Tremco Acrylic Latex 834," Tremco, Inc.
 - 4) Approved equal

2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin), or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

- A. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates. Confirm compatibility of cleaners with adjacent surfaces prior to application.
- B. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.

- d. Exterior insulation and finish systems.
- 3. Remove laitance and form-release agents from concrete.
- 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.5 JOINT SEALANT SCHEDULE (Select from the following where indicated or required)

JOINT SEALANT SCHEDULE		
DESIGNATION ON DATA SHEETS	JOINT SEALERS	DESCRIPTION OF JOINT CONSTRUCTION AND LOCATION WHERE SEALANT IS TYPICALLY APPLIED
ES-4	One-Part Acid Curing Silicon	Exterior and interior joints in vertical surfaces of non-porous surfaces. To be used on exterior and interior perimeter frames of walls and control and expansion and window joints. Between metal to metal, glass to glass, metal to glass, travertine to travertine, cap beads on glass.
ES-5	One-Part Mildew Resistant Silicone Sealant	Interior joints in vertical surfaces of ceramic tile in toilet rooms.
LS1	Latex Sealant	Exposed interior applications.
Notes:	<ol style="list-style-type: none"> 1. Install sealant in joints fitting descriptions and locations listed. 2. "LS1 is for interior use only and are to be applied only if an "ES" designation is not otherwise indicated and where movement capacity and weathering characteristics are not critical. 4. If locations are encountered that are not described above, sealant manufacturer's recommendations are to be followed. The issue is to be brought to the attention of the Contracting Officer and General Contractor in writing. The appropriate sealant shall be submitted as part of the submittal process. 	

END OF SECTION 079200
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 081111 – HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Standard hollow-metal steel frames.
- B. Related Sections include the following:
 - 1. Section 087100 “Door Hardware” for door hardware for standard doors.
 - 2. Section 099600 “High Performance Coatings” for field painting standard steel doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.

1.3 SUBMITTALS

- A. Product Data: Include construction details, sizes, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes for each type of steel door and frame specified.
- B. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.
- C. Shop Drawings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.
- D. Fire-Rated Door Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
 - 1. Test Pressure: Test at atmospheric (neutral) pressure according to NFPA 252 or UL 10B.
 - 2. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
 - 3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.
 - 1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating standard steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price as shown on the Schedule of Items for the building.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Benchmark Doors; a division of General Products Co., Inc.
 - 3. Ceco Door Products; an ASSA ABLOY Group Company.
 - 4. CURRIES Company; an ASSA ABLOY Group Company.
 - 5. Deansteel Manufacturing, Inc.
 - 6. Fleming Door Products Ltd.; an ASSA ABLOY Group Company.
 - 7. Kewanee Corporation (The).
 - 8. Mesker Door Inc.
 - 9. Pioneer Industries, Inc.
 - 10. Republic Builders Products Company.
 - 11. Steelcraft; an Ingersoll-Rand Company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 zinc-iron-alloy (galvannealed) coating designation.
- D. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591/A 591M, Commercial Steel (CS), Class B coating; mill phosphatized.
- E. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.
- G. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching standard steel door frames of type indicated.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
 - 2. Frames for Level 2 Steel Doors: 0.075-inch- thick steel sheet, unless otherwise indicated.
- C. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
 - 1. Fabricate knocked-down frames with mitered or coped corners, for field assembly.
 - 2. Fabricate knocked-down, drywall slip-on frames for in-place gypsum board partitions.
 - 3. Frames for Wood Doors: 0.067-inch- thick steel sheet.
 - 4. Rated assemblies where noted on drawings
- D. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.
- E. Jamb Anchors:
 - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 2. Compression Type for Slip-on Frames: Adjustable compression anchors.
- F. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- G. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- H. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick.

2.4 STOPS AND MOLDINGS

- A. Fixed Frame Moldings: Formed integral with standard steel frames, minimum 5/8 inch high, unless otherwise indicated.

2.5 FABRICATION

- A. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
 - 3. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
 - 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Four anchors per jamb from 60 to 90 inches in height.
 - 2) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

- b. Compression Type: Not less than two anchors in each jamb.
- 6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
- B. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
 - 1. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
 - 2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

2.6 STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Finish standard steel door and frames after assembly.
- B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel doors and frames.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install standard steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Standard Steel Frames: Install standard steel frames for doors and other openings, of size and profile indicated. Comply with SDI 105.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.
 3. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off standard steel doors and frames immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

- D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081111

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing flush wood doors.
- B. Related Sections:
 - 1. Division 06 Section "Interior Architectural Woodwork" for wood door casings and frames.

1.2 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
- C. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."
 - 1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.5 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.

- b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
- 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
- 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Algoma Hardwoods, Inc.
 - 2. Buell Door Company Inc.
 - 3. Chappell Door Co.
 - 4. Graham; an Assa Abloy Group company.
 - 5. Lambton Doors.
 - 6. Marlite.
 - 7. Mohawk Flush Doors, Inc.; a Masonite company.
 - 8. Approved equal.

2.2 DOOR CONSTRUCTION, GENERAL

- A. WDMA I.S.1-A Performance Grade:
 - 1. Heavy Duty unless otherwise indicated.
 - 2. Extra Heavy Duty: Toilets, Janitor's closets, and where indicated.
 - 3. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- B. Structural-Composite-Lumber-Core Doors:
 - 1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core Doors:
 - 1. Grade: Premium, with Grade A faces.
 - 2. Species: Birch.
 - 3. Cut: Plain sliced (flat sliced).
 - 4. Match between Veneer Leaves: Book match.
 - 5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
 - 6. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
 - 7. Exposed Vertical Edges: Applied wood edges of same species as faces and covering edges of crossbands.
 - 8. Core: Either glued wood stave or structural composite lumber.
 - 9. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
 - 10. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Flush rectangular beads.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors in factory.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished.

2.6 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory.
- C. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: AWI catalyzed polyurethane system.
 - 3. Staining: As directed on drawings.
 - 4. Effect: Filled finish.
 - 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 082143 – ENTRY DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior out-swinging entry doors and frames.
- B. Related Sections:
 - 1. Division 06 Section "Interior Architectural Woodwork" for wood casings.
 - 2. Division 08 Section "Door Hardware".

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Include details of construction and glazing.
 - 2. Include factory finishing specifications.
- B. Shop Drawings: For aluminum clad wood doors. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:
 - 1. Dimensions of doors for factory fitting.
 - 2. Locations and dimensions of mortises and holes for hardware.
 - 3. Doors to be factory finished, and finish requirements.
- C. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain aluminum clad wood doors from single manufacturer.
- B. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

1.4 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
 - 1. AAMA 502 – Voluntary Specification for Field Testing of Windows and Sliding Doors.
 - 2. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM B 368 – Copper-Accelerated Acetic Acid - Salt Spray (Fog) Testing (CASS Test).
 - 2. ASTM C 1036 – Flat Glass.
 - 3. ASTM C 1048 – Heat-Treated Flat Glass–Kind HS, Kind FT Coated and Uncoated Glass.
 - 4. ASTM D 1149 – Rubber Deterioration – Surface Ozone Cracking in a Chamber.
 - 5. ASTM D 2803 – Filiform Corrosion Resistance of Organic Coatings on Metal.
 - 6. ASTM D 4060 – Abrasion Resistance of Organic Coatings by the Taber Abraser.
 - 7. ASTM E 283 – Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
 - 8. ASTM E 330 – Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

9. ASTM E 331 – Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
10. ASTM G 85 – Modified Salt Spray (Fog) Testing.
- C. Window and Door Manufacturers Association (WDMA):
 1. AAMA/WDMA/CSA 101/I.S.2/A440 – Windows, Doors and Unit Skylights.
 2. WDMA I.S.4 – Water Repellent Preservative Treatment for Millwork.
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - A. Comply with manufacturer's written instructions and requirements of quality standard referenced in Part 2.
 - B. Package doors individually in opaque plastic bags or cardboard cartons.
 - C. Mark each door on top and bottom edge with opening number used on Shop Drawings.
- 1.6 PROJECT CONDITIONS
 - A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- 1.7 PERFORMANCE REQUIREMENTS
 - A. Doors shall have a certified rating in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 for limited water penetration resistance for side-hinged doors.
 - B. Door Unit Air Leakage, ASTM E 283, 1.57 psf (25 mph): 0.30 cfm per square foot of frame or less.
 - C. Door Unit Water Penetration: No water penetration through door unit when tested in accordance with ASTM E 331 with water applied at rate of 5 gallons per hour per square foot. Doors with low profile sill (ADA) shall have water resistance rating of 0 psf.
- 1.8 WARRANTY
 - A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship, or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - B. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - C. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 1. Exterior Doors: Five years.
 2. Insulating Glass Vision Panels: Five years.
- 1.9 MEASUREMENT AND PAYMENT
 - A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- 2.2 General: Use only materials that comply with referenced standards and other requirements specified.
- 2.3 Assemble exterior doors and sidelites, including components, with wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.

2.4 OUT-SWING ENTRY DOORS

2.5 Out-Swing Entry Doors: Factory-assembled doors with outward-swing door panels installed in frames. Basis of Design: Anderson Out Swing Entry Doors, or an approved equal by one of the following:

1. Marvin
2. Jeld-Wen.

B. Frames:

1. Finger jointed, edge-glued vertical grain Douglas fir core with clear vertical grain veneer.
 - a. Kiln dried to a moisture content no greater than twelve (12) percent at the time of fabrication.
 - b. Water repellent, preservative treated in accordance with WDMA I.S.4.
2. Frame width: 4-9/16 inches (116 mm); 6-9/16 inches.
3. Frame thickness: 1-1/16 inches.
4. Exterior extruded aluminum clad 0.050 inch thick.
5. Low profile sill (No sill – sill supplied and applied by others.
6. Jambs extended 7/8 inch beyond panel bottom).

C. Overall Frame Depth: Field verify.

D. Door Panels:

1. Stiles: finger jointed, edge-glued LVL. Rails: finger jointed, edge-glued pine, vertical grain Douglas fir cores with vertical grain Douglas fir veneer.
 - a. Kiln dried to a moisture content no greater than twelve (12) percent at time of fabrication.
 - b. Water repellent, preservative treated in accordance with WDMA I.S.4.
2. Stiles contain laminated veneer lumber (LVL) core, solid wood top and bottom rail, with vertical grain Douglas fir veneers.
3. Composite panel thickness: 1-3/4 inches; 2 ¼ inches.
4. Exterior extruded aluminum clad 0.055 inch thick.
5. Top rail width: 1 ¾ inch panel 6 inches; 2 ¼ inch panel 8 1/8 inches.
6. Stile width: 6 inches.
7. Bottom rail height: 11-3/8 inches.
8. Panel corners glued and fastened with 5/8 X 4 inch fluted hardwood dowels. Removable interior vinyl glazing stops with clear wood covers; 1 ¾ inch panel - no visible fastener holes (2 ¼ inch panel – nailed on glazing stops).

E. Weather Strip:

1. Head and Jambs: Closed-cell foam wrapped with vinyl jacket at head and jambs.
2. Sill: Dual-durometer bulb extruded polymer on threshold shall contact face of door panel.

2.6 GLAZING

A. Glazing:

1. Type: See Glazing specification.
2. 1-Inch Tempered Insulating Glass: Tempered, Match aluminum Clad Wood Windows Glazing

2.7 HARDWARE

- A. Hinges: 4 ½” X 4 ½” square corner ball bearing hinges.
- B. Finish: See Drawings.

2.8 FINISH

- A. Exterior: Aluminum clad. Fluoropolymer modified acrylic topcoat applied over primer. Meets or exceeds AAMA 2605 requirements.

1. Standard Color: Bronze;
2. Interior: See Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and substrates, with Installer present, for suitable conditions where wood stile and rail doors will be installed.
- B. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 1. Reject doors with defects.
 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install door frames level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
- B. Countersink fasteners, fill surface flush, and sand smooth.
- C. Hardware: For installation, see Division 08 Section "Door Hardware."
- D. Install wood doors to comply with manufacturer's written instructions, WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," AWT's "Architectural Woodwork Quality Standards," and other requirements specified.
- E. Field-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
- F. Clearances: Provide 1/8 inch (3 mm) at heads, and jambs. Where threshold is shown or scheduled, provide 1/4 inch (6 mm) from bottom of door to top of threshold.
- G. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- H. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- I. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081433

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Access doors and frames for walls and ceilings, where required by COR, maximum 6 doors required.
- B. Related Sections include the following:
 - 1. Division 08 Section "Door Hardware" for mortise or rim cylinder locks and master keying.
 - 2. Division 23 Section "Air Duct Accessories" for heating and air-conditioning duct access doors.

1.2 SUBMITTALS

- A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
- B. Size Variations: Obtain Contracting Officer's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.4 COORDINATION

- A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

1.5 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with A60 zinc-iron-alloy (galvannealed) coating or G60 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.
- B. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - 1. Surface Preparation for Metallic-Coated Steel Sheet: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
 - a. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - 2. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with

paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.

- C. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:
 - 1. Acudor Products, Inc.
 - 2. J. L. Industries, Inc.
 - 3. MIFAB, Inc.
 - 4. Milcor Inc.
- B. Flush Access Doors and Trimless Frames: Fabricated from metallic-coated steel sheet.
 - 1. Locations: Wall and ceiling surfaces.
 - 2. Door: Minimum 0.060-inch- thick sheet metal, set flush with surrounding finish surfaces.
 - 3. Frame: Minimum 0.060-inch- thick sheet metal with drywall bead flange.
 - 4. Hinges: Continuous piano.
 - 5. Latch: Cam latch operated by screwdriver with interior release.
 - 6. Lock: Cylinder.
 - a. Lock Preparation: Prepare door panel to accept cylinder specified in Division 08 Section "Door Hardware."

2.3 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
 - 1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
 - 2. Provide mounting holes in frames for attachment of units to metal or wood framing.
 - 3. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.
- D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
 - 1. For cylinder lock, furnish two keys per lock and key all locks alike.
 - 2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.
- E. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors and hardware after installation for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 084113 - ALUMINUM-FRAMED STOREFRONT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior storefront framing.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to deflection from uniformly distributed and concentrated live loads. Structural drawings indicate up to 5/8" deflection in the w-beam above the aluminum storefront. The aluminum storefront shall be appropriately designed for indicated deflection.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Wind Loads: As indicated on Structural Drawings.

D. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft.

E. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

C. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.

1.6 QUALITY ASSURANCE

- A. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
- C. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.
- D. Preinstallation Conference: Conduct conference at Project site.

1.7 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product provided by but not limited to of the following:
 - 1. Arcadia, Inc.
 - 2. Arch Aluminum & Glass Co., Inc.
 - 3. EFCO Corporation.
 - 4. Kawneer North America; an Alcoa company.
 - 5. TRACO.
 - 6. Tubelite.
 - 7. United States Aluminum.
 - 8. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

2.2 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209.
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 - 4. Structural Profiles: ASTM B 308/B 308M.
 - 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
 - 1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Front.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 - 2. Reinforce members as required to receive fastener threads.
 - 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Division 08 Section "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ACCESSORY MATERIALS

- A. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

2.6 FABRICATION

- A. Form or extrude aluminum shapes before finishing.

- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from exterior.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - 1. Color: As noted on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 - 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 - 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Division 08 Section "Glazing."

END OF SECTION 084113
NOVEMBER 2018

USDA FOREST SERVICE, R-4

FLAMING GORGE RANGER DISTRICT OFFICE ADDITION

SECTION 085200 - ALUMINUM CLAD WOOD WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes aluminum-clad wood windows.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranties.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: Five years from date of Substantial Completion.
 - c. Aluminum-Cladding Finish: 10 years from date of Substantial Completion.

1.5 MEASUREMENT AND PAYMENT:

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Aluminum-Clad Wood Windows:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hurd Windows and Doors.
 - b. Marvin Windows and Doors.
 - c. Sierra Pacific Windows; Sierra Pacific Industries.
 - d. Kolbe Windows and Doors.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Minimum Performance Class: LC. (Light Commercial)
- B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.33 Btu/sq. ft. x h x deg F .

- C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

2.3 ALUMINUM CLAD WOOD WINDOWS

- A. Operating Types: As indicated on Drawings.
- B. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.
 - 1. Exterior Finish: Aluminum-clad wood.
 - a. Aluminum Finish: Manufacturer's standard fluoropolymer two-coat system with fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight and complying with AAMA 2605.
 - b. Exposed Unfinished Wood Surfaces: Pine.
 - c. Color: As selected by COR from manufacturer's full range.
 - 2. Interior Finish: Unfinished.
 - a. Exposed Unfinished Wood Surfaces: Pine, stained, varnished.
- C. Glass: See Section 088000
- D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- E. Hardware, General: Manufacturer's standard corrosion-resistant hardware sized to accommodate sash weight and dimensions.
 - 1. Exposed Hardware Color and Finish: As selected by COR from manufacturer's full range.
- F. Projected Window Hardware:
 - 1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by COR from manufacturer's full range of types and styles.
 - 2. Hinges: Manufacturer's standard type for sash weight and size indicated.
 - 3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches (735 mm) tall and two arms on taller sashes.
- G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Full, inside for project-out sashes.
- B. Aluminum Frames: Complying with SMA 1004 or SMA 1201.
 - 1. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.
- C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh complying with ASTM D 3656.
 - 1. Mesh Color: Manufacturer's standard.

2.5 FABRICATION

- A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze wood windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- D. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
- E. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 087100
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY:

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
- B. Products furnished, but not installed, under this Section include the products listed below. Coordinating and scheduling the purchase and delivery of these products remain requirements of this Section.
 - 1. Permanent lock cores to be installed by the Government.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - 2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

1.3 QUALITY ASSURANCE

- A. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- B. Accessibility Requirements: Comply with applicable provisions in the ABA Standards of the Federal agency having jurisdiction and ICC A117.1 for door hardware on doors in an accessible route.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.

4. Closers: Adjust door and gate closer sweep periods so that, from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver keys and permanent cores to COR by registered mail or overnight package service.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

1.6 MEASUREMENT AND PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.
 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, products equivalent in function and comparable in quality to named products.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.

2.2 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
 1. Three Hinges: For doors with heights 61 to 90 inches.
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Weight: Unless otherwise indicated, provide the following:
 1. Entrance Doors: Heavy-weight hinges.
 2. Doors with Closers: Antifriction-bearing hinges.
 3. Interior Doors: Standard-weight hinges.
- D. Hinge Base Metal: Unless otherwise indicated, provide the following:
 1. Exterior Hinges: Stainless steel, with stainless-steel pin.
 2. Interior Hinges: Steel, with steel pin.
 3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.
- E. Hinge Options: Where indicated in door hardware sets or on Drawings:

1. Nonremovable Pins: At exterior doors. Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging corridor doors with locks.
2. Corners: Square.

F. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors and frames.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

2.4 LOCKS AND LATCHES, GENERAL

- A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." ANSI A117.1. FED-STD-795, "Uniform Federal Accessibility Standards."

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

- B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Lock Trim:

1. Levers: Cast.
2. Escutcheons (Roses): Cast.
3. Dummy Trim: Match lever lock trim and escutcheons.
4. Lockset Designs: Provide design indicated on Drawings or, if sets are provided by another manufacturer, provide designs that match those designated.

- D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:

1. Bored Locks: Minimum 1/2-inch latchbolt throw.
2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
3. Deadbolts: Minimum 1-inchbolt throw.

- E. Backset: 2-3/4 inches, unless otherwise indicated.

- F. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:

1. Strikes for Auxiliary Deadlocks: BHMA A156.5.
2. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2.5 MECHANICAL LOCKS AND LATCHES

- A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

- B. Bored Locks: BHMA A156.2; Grade 1; Series 4000.

- C. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.

2.6 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.5; Grade 1; with strike that suits frame.
- B. Mortise Auxiliary Locks: BHMA A156.5; Grade 1; with strike that suits frame.
- C. Narrow Stile Auxiliary Locks: BHMA A156.5; Grade 1; with strike that suits frame.
- D. Push-Button Combination Locks: BHMA A156.5; cylindrical; Grade 1; lock opens by entering a one- to five-digit code by pushing correct buttons in correct sequence; automatically relocks when door is closed; with strike that suits frame.
 - 1. Basis of Design: Kaba Access, E-Plex E583 IIC with IC cores, lever handle stand alone card based access with PIN.
 - 2. HSPD-12 compatible.
 - 3. Programmable at lock.

2.7 SURFACE BOLTS

- A. Surface Bolts: BHMA A156.16.

2.8 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.

2.9 LOCK CYLINDERS

- A. High-Security Lock Cylinders: BHMA A156.30, Grade 1;
 - 1. Key Control Level: Category A (Stamp "Do not Duplicate").
- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Six.
 - 2. Bored-Lock Type: Cylinders with tailpieces to suit locks.
- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Removable Cores: Core insert, removable by use of a special key; for use only with core manufacturer's cylinder and door hardware.
- D. Construction Keying: Comply with the following:
 - 1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 5 construction master keys.
 - a. Furnish permanent cores to Owner for installation.
- E. Manufacturer: Same manufacturer as for locks and latches.

2.10 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Manufacturer: Same manufacturer as for locking devices.
- B. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 4 construction master keys.
- C. Construction Cores: Provide construction cores that are replaceable by permanent cores.

2.11 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 - 1. Master Key System: Change keys and a master key, operate cylinders.
 - B. Keys: Brass.
 - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."
 - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
- 2.12 OPERATING TRIM
- A. Operating Trim: BHMA A156.6; stainless steel, unless otherwise indicated.
- 2.13 ACCESSORIES FOR PAIRS OF DOORS
- A. Astragals: BHMA A156.22.
- 2.14 SURFACE CLOSERS
- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- 2.15 MECHANICAL STOPS AND HOLDERS
- A. Wall- and Floor-Mounted Stops: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
- 2.16 DOOR GASKETING
- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
- 2.17 THRESHOLDS
- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
- 2.18 METAL PROTECTIVE TRIM UNITS
- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.
- 2.19 FABRICATION
- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door

hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.20 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
- B. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 1. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- C. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- D. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 1. Furnish permanent cores to Owner for installation.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

- G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- J. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

END OF SECTION 087100
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Glass for windows, doors, interior borrowed lites.
 - 2. Glazing sealants and accessories.

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

1.6 MEASUREMENT AND PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. PPG or approved equal.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.

1. Design Wind Pressures: As indicated on Drawings.
 2. Design Snow Loads: As indicated on Drawings.
 3. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F .
 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Glazing Manual."
 2. IGMMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IgCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- D. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- E. Pyrolytic-Coated, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
1. Sealing System: Dual seals.

2. Spacer: Manufacturer's standard spacer material and construction.
- B. Solar-Control Low-E Insulating-Glass Units:
 1. Basis of Design Products:
 - a. PPG SOLARBAN 60 (2) Starphire Glass.
 2. Overall Unit Thickness and Thickness of Each Lite: 1" total 6.0 mm panes.
 3. Interspace Content: Air.
 - a. Low E Coating, Solarban 60 (2): Pyrolytic coating on second surface.
 4. Visible Light Transmittance: 73 percent minimum (assumed).
 5. Winter Nighttime U-Factor: 0.29 maximum (assumed).
 6. Summer Daytime U-Factor: 0.28 maximum (assumed).
 7. Solar Heat Gain Coefficient: 0.41 maximum (assumed).
 8. Shading Coefficient: 0.47

2.6 GLAZING SEALANTS

- A. General:
 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As indicated by manufacturer's designations.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- F. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.4 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.5 INSULATING GLASS SCHEDULE

- A. Glass Type: Ultraclear annealed fully tempered float glass.

1. Basis-of-Design Product: AGC Glass Company North America, Inc.; Krystal Klear Guardian Industries Corp.; Ultrawhite Pilkington North America Inc.; Optiwhite , PPG Industries, Inc.; Starphire Saint-Gobain Corporation; Diamant.
 2. Minimum Thickness: 6 mm.
- B. Glass Type: Tinted annealed fully tempered float glass.
1. Install in any location where safety glass is required
- C. Basis of Design Products for **all exterior** applications:
1. PPG SOLARBAN 60 (2) Starphire Glass.
 - a. Overall Unit Thickness and Thickness of Each Lite: 6.0 mm.
 - b. Interspace Content: Air.
 - c. Low E Coating, Solarban 60 (2): Pyrolytic coating on second surface.
 - d. Retain one of three subparagraphs below to specify low-e coating or film or both. Low-e film applies to "Heat Mirror" by Southwall Technologies.
 2. Visible Light Transmittance: 73 percent minimum (assumed).
 3. Winter Nighttime U-Factor: 0.33 maximum (assumed).
 4. Summer Daytime U-Factor: 0.33 maximum (assumed).
 5. Solar Heat Gain Coefficient: 0.41 maximum (assumed).
 6. Shading Coefficient: 0.47
- D. Basis of Design for Interior Insulating Units: PPG, clear, 1" thick, air filled insulating units for sound isolation or approved equal.
- E. Basis of Design for single pane, fire rated interior units: 5/16" Tempered, fire Rated PyroGuard by TPG or an approved equal.

END OF SECTION 088000
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.5 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BPB America Inc.
 - b. G-P Gypsum.
 - c. USG Corporation.
 - d. Approved equal.
- B. Type X:

1. Thickness: 5/8 inch.
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- C. Moisture- and Mold-Resistant Type, where indicated: With moisture- and mold-resistant core and surfaces.
1. Core: 5/8 inch, Type X.
 2. Long Edges: Tapered.
- D. Cementitious Backer Units: ANSI A118.9.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Custom Building Products; Wonderboard.
 - b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
 - c. USG Corporation; DUROCK Cement Board.
 3. Thickness: 1/2 inch unless otherwise indicated.
- 2.3 TRIM ACCESSORIES (Select from the following)
- A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
- 2.4 JOINT TREATMENT MATERIALS
- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
1. Interior Gypsum Wallboard: Paper.
 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 3. Cementitious Backer Units: As recommended by backer unit manufacturer.
- 2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- D. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."
- E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

- H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install exterior glass-mat gypsum sheathing board in the following locations:
 - 1. Type X: Vertical surfaces, unless otherwise indicated.
 - 2. Ceiling Type: Type X
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.

3.4 APPLYING TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch gap where panels abut other construction or penetrations.
- B. Cementitious Backer Units: ANSI A108.11, at showers, and locations indicated.
- C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. L-Bead: Use where indicated.
 - 4. U-Bead: Use at exposed panel edges and where indicated.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile and accessories.
 - 2. Waterproof membrane.
 - 3. Crack isolation membrane.
 - 4. Tile backing panels.
 - 5. Metal edge strips.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples:
 - 1. Each type and composition of tile and for each color and finish required.
 - 2. Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.
- C. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of 5 full-size units of amount installed for each type, composition, color, pattern, and size indicated.

1.3 MEASUREMENT AND PAYMENT:

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Manufacturer: Daltile Corporation; 7834 C.F. Hawn Freeway, Dallas, TX 75217. ASD. Tel: (214) 398-1411 or (800) 933-TILE. www.daltileproducts.com or Government approved equal
 - 1. See drawings for tile selection

2.2 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Satin natural anodized extruded aluminum, stainless steel, brass, etc, style and dimensions to suit application, for setting using tile mortar or adhesive; use in the following locations:
 - 1. Transition between different floor finishes.
 - 2. Expansion and control joints, floor and wall.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

2.4 SETTING MATERIALS

A. Mortar Bed Materials:

1. Portland cement: ASTM C150, type 1, gray or white.
2. Hydrated Lime: ASTM C207, Type S.
3. Sand: ASTM C144, fine.
4. Latex additive: As approved.
5. Water: Clean and potable.

B. Mortar Bond Coat Materials:

1. Latex-Portland Cement type: ANSI A118.4.

C. Polymer modified cement grout, sanded or un-sanded, as specified in ANSI A118.7; color as selected.

D. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced with 2 inch (50 mm) wide coated glass fiber tape for joints and corners:

1. Thickness: 5/8 inch (16 mm).

E. Cleavage Membrane: Shutler Ditra, uncoupling (cleavage) membrane or equal.

F. Shower Backer System: Install showers using Kerdi Shower wall covering, with polystyrene base by Schluter Systems or a Government approved equal.

2.5 GROUT MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10.

B. Standard Cement Grout: ANSI A118.6.

1. Basis-of-Design Product: "Daltile" Color Floor Grout with latex additive (laticrete) or comparable product as to be selected by COR by one of the following manufacturers.
2. Color: As Selected by COR from Manufacturers full range.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Daltile.
 - b. Bostik, Inc.
 - c. Laticrete International, Inc.
 - d. MAPEI Corporation.

2.6 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."

B. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
 - b. Dow Corning Corporation; Dow Corning 786.
 - c. GE Silicones, a division of GE Specialty Materials; Sanitary 1700.
 - d. Laticrete International, Inc.; Latacil Tile & Stone Sealant.
 - e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - f. Tremco Incorporated; Tremsil 600 White.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Remove any curing compounds or other contaminants.
- C. Vacuum clean surfaces and damp clean.
- D. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- E. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dry-set mortar to a feather edge.
- F. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.
- G. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.

3.3 INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).
 - 2. Quarry Tile: 1/16 inch (1.6 mm).
 - 3. Paver Tile: 1/16 inch (1.6 mm).
 - 4. Glazed Wall Tile: 1/16 inch (1.6 mm).
 - 5. Decorative Thin Wall Tile: 1/16 inch (1.6 mm).

- G. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- H. Install cementitious backer units and fiber-cement underlayment and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.4 CLEANING

- A. Clean tile and grout surfaces.

3.5 PROTECTION OF FINISHED WORK

- A. Do not permit traffic over finished floor surface for 72 hours after installation.
- B. Cover floors with kraft paper and protect from dirt and residue from other trades.
- C. Where floor will be exposed for prolonged periods cover with plywood or other similar type walkways

END OF SECTION 093000

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 096400 - WOOD FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Factory-finished wood flooring.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Hardwood Flooring: Comply with NWFA A500 for species, grade, and cut.

1. Certification: Provide flooring that carries NWFA grade stamp on each bundle or piece.

2.2 FACTORY-FINISHED WOOD FLOORING

A. Solid-Wood Flooring: Kiln dried to 6 to 9 percent maximum moisture content; tongue and groove and end matched; with backs channeled.

1. Basis of Design Product: Shaw Harwood "Canyon Cliffs" Hickory Flooring Pre finished.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Armstrong World Industries, Inc.
 - b. Bellawood.
 - c. Carlisle Wide Plank Floors.
 - d. Shaw Flooring.
3. Species: Hickory.
4. Cut: Plain sawn.
5. Thickness: 3/4 inch
6. Face Width: 3-1/4 inches.
7. Lengths: Random-length strips complying with applicable grading rules.
8. Edge Style: Beveled (eased).
9. Finish: UV urethane.

- a. Color: As selected by COR from manufacturer's full range.

2.3 ACCESSORY MATERIALS

- A. Wood Sleepers and Subfloor: As specified in Section 061000 "Rough Carpentry" and Section 061600 "Sheathing."
- B. Wood Underlayment: As specified in Section 061600 "Sheathing."
- C. Vapor Retarder: ASTM D4397, polyethylene sheet not less than 10.0 mils thick.
- D. Asphalt-Saturated Felt: ASTM D4869/D4869M, Type II.
- E. Wood Flooring Adhesive: Mastic as recommended/ needed for minor areas by flooring and adhesive manufacturers for application indicated.
- F. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood flooring manufacturer.
- G. Fasteners: As recommended by manufacturer, but not less than that recommended in NWFA's "Installation Guidelines."
- H. Thresholds and Saddles: To match wood flooring. Tapered on each side to meet ADA requirements. Shown in plans
- I. Cork Expansion Strip: Composition cork strip.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Concrete Slabs:
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 4.5 lb of water/1000 sq. ft. in 24 hours.

3.2 PREPARATION

- A. Concrete Slabs:
 - 1. Grind high spots and fill low spots to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 - 2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
 - 3. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

- B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Comply with flooring manufacturer's written installation instructions, but not less than applicable recommendations in NWFA's "Installation Guidelines."
- B. Wood Sleepers and Subfloor: Install according to requirements in Section 061000 "Rough Carpentry" and Section 061600 "Sheathing."
- C. Wood Underlayment: Install according to requirements in Section 061600 "Sheathing."
- D. Provide expansion space at walls and other obstructions and terminations of flooring of not less than 3/4 inch.
- E. Vapor Retarder: Comply with the following for vapor retarder installation:
 - 1. Wood Flooring Nailed to Sleepers over Concrete: Install flooring over a layer of polyethylene sheet with edges overlapped over sleepers and turned up behind baseboards.
- F. Solid-Wood Flooring: Blind nail or staple flooring to substrate.
 - 1. Plank Flooring: For flooring of face width more than 3 inches :
 - a. Hardwood: Install countersunk screws at each end of each piece in addition to blind nailing. Cover screw heads with wood plugs glued flush with flooring.

3.4 PROTECTION

- A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
 - 1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400

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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

1.3 MEASUREMENT AND PAYMENT:

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 - 3. Flexco.
 - 4. Johnsonite; A Tarkett Company.
 - 5. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
 - 1. Group: I (solid, homogeneous).
 - 2. Style and Location:
 - a. Style B, Coved.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Colors: As selected by COR from full range of industry colors.

2.2 RUBBER MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Roppe Corporation, USA.
 - 2. VPI Corporation.
- B. Description: Rubber stair-tread nosing carpet edge for glue-down applications nosing for carpet nosing for resilient flooring reducer strip for resilient flooring joiner for tile and carpet transition strips.
- C. Profile and Dimensions: As indicated.
- D. Locations: Provide rubber molding accessories in areas indicated.
- E. Colors and Patterns: As selected by COR from full range of industry colors.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Preformed Corners: Install preformed corners before installing straight pieces.

3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.

- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09651
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 096810 - CARPET TILE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes carpet tile and installation.
- B. Related Sections include the following:
 - 1. Division 09 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation methods.
- B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
- C. Maintenance Data: For carpet tile to include in maintenance manual. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.4 PROJECT CONDITIONS

- A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."
- B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tile over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.5 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Carpet Tile Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Interface, LLC.
 - 2. Mannington Mills, Inc.
 - 3. Shaw Contract Group; a Berkshire Hathaway company.
 - 4. Tandus; a Tarkett company.
- B. Basis of Design Product: Subject to compliance with requirements, provide the following (or approved equal):
 - 1. See Drawings for Selection.
 - 2. Source: Tandus, Corp, 311 Smith Industrial Road PO Box 1447 Dalton, GA , 1-800-248-2878
 - 3. Or approved equal acceptable to Contracting Officer's Representative.
- C. Available with Recycled Content: Yes
- D. Construction Type: Accuweave Patterned loop.
- E. Gauge: 1/12.
- F. Stitches per inch: 10.0
- G. Pile Height Average: 0.187 inch
- H. Fiber System: TDX Nylon.
- I. Dye Method: 65% Solution Dyed / 35% Yarn Dyed
- J. Face Weight: Carpet Tile – 20 oz. per sq. yd.
- K. Backing: ER3 Modular tile 18" x 18", Non-Woven Synthetic fiber
- L. Warranty: 15 year

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and that is recommended by carpet tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Verify that substrates and conditions are satisfactory for carpet tile installation and comply with requirements specified.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Comply with CRI 104 requirements for Carpet Tile.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- F. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 15, "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096810
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 097700 - SPECIAL WALL FINISHES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Fiber-reinforced plastic (FRP) sheet and panel wall coverings.

1.2 SUBMITTALS

- A. Product Data: Include physical characteristics, such as durability, resistance to fading, and flame resistance, for each impact-resistant wall protection system component indicated.
- B. Samples for Verification: For the following products, showing the full range of color and texture variations expected in each impact-resistant wall protection system component. Prepare Samples from the same material to be used for the Work.
 - 1. Sheet or Panels: 6-by-6-inch- square Samples of each impact-resistant wall protection system component required.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store wall surface-protection materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
 - 1. Maintain room temperature within the storage area at not less than 70 deg F during the period plastic materials are stored. Keep sheet material out of direct sunlight to avoid surface distortion.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install wall surface-protection system components until the space is enclosed and weatherproof and ambient temperature within the building is maintained at not less than 70 deg F for not less than 72 hours before beginning installation. Do not install rigid plastic wall surface-protection systems until that temperature has been attained and is stabilized.

1.5 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering impact-resistant wall protection system products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Kemlite Company Inc.
 - 2. Marlite.
 - 3. Dynaglass.
 - 4. Approved equal.

2.2 MATERIALS

- A. Fiber Reinforced Wall Covering Material: Semirigid, textured, chemical- and stain-resistant, high-impact-resistant, PVC or acrylic-modified vinyl plastic sheet; thickness of 0.09 inches; with a minimum impact resistance of 25.4 ft-lbf/in. of width when tested according to ASTM D 256, Test Method A.
 - 1. Color and Texture: As indicated in drawings or, as selected by COR.
- B. Fasteners: Provide aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with aluminum components, hardware, anchors, and other items being fastened. Use theftproof fasteners where exposed to view.
- C. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated.

2.3 FABRICATION

- A. General: Fabricate impact-resistant wall and corner protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including thicknesses of components.
- B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions in which impact-resistant wall protection system components and impact-resistant wall covering materials will be installed.
 - 1. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Fiberglass Reinforced Plastic Wall Covering Materials: Wall surfaces to receive impact-resistant wall covering materials shall be dry and free from dirt, grease, loose paint, and scale.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.
- B. General: Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

- A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

3.4 CLEANING

- A. General: Immediately on completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent. Clean metal components according to the manufacturer's written instructions.
- B. Remove excess adhesive using methods and materials recommended by the manufacturer.
- C. Remove surplus materials, rubbish, and debris, resulting from installation, on completion of work and leave installation areas in neat, clean condition.

END OF SECTION 097700

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 099120 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following substrates:
 - 1. Steel doors and frames.
 - 2. Gypsum board.
 - 3. Exposed steel.
 - 4. Galvanized metal.
 - 5. Fiber cement Siding
- B. Related Sections include the following:
 - 1. Division 9 Section "High Performance Coatings".

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

1.3 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 1 gal. of each material and color applied.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Columbia Paint & Coatings.
 - 2. ICI Paints.
 - 3. Sherwin-Williams Company (The).
 - 4. Approved equal.

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As indicated in a color schedule or selected by Contracting Officer.

2.3 METAL PRIMERS

- A. Alkyd Anticorrosive Metal Primer: MPI #79.
- B. Cementitious Galvanized-Metal Primer: MPI #26.

2.4 ALKYD PAINTS

- A. Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).

2.5 INTERIOR PRIMERS/SEALERS

- A. Interior Latex Primer/Sealer: MPI #50.
- B. Interior Alkyd Primer/Sealer: MPI #45.

2.6 INTERIOR METAL PRIMERS

- A. Waterborne Galvanized-Metal Primer: MPI #134.
- B. Rust-Inhibitive Primer (Water Based): MPI #107.

2.7 LATEX PAINTS (Select from the following as indicated)

- A. High-Performance Architectural Latex (Low Sheen): MPI #138 (Gloss Level 2).
- B. High-Performance Architectural Latex (Eggshell): MPI #139 (Gloss Level 3).
- C. High-Performance Architectural Latex (Satin): MPI #140 (Gloss Level 4).
- D. High-Performance Architectural Latex (Semigloss): MPI #141 (Gloss Level 5).

2.8 LATEX PAINTS for EXTERIOR SIDING (Select from the following as indicated)

- A. Sherwin Williams "Loxon Masonry Primer" or a Government approved equal endorsed by siding manufacuter.

- B. Sherwin Williams "Duration" Exterior Latex Coating, (Gloss Level 2)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.
- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- F. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- G. Prepare exterior siding as directed by composite siding manufacturer.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Siding:
 - 1. Paint siding as required by siding manufacturer.
 - 2. Ensure Exterior temperatures are within standards noted by paint manufacturer for exterior application.
- F. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 - 1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 - 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Contracting Officer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- A. Exposed Steel Substrates:
 - 1. High-Performance Architectural Latex System: MPI INT 5.1R.
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: High-performance architectural latex matching topcoat.
 - c. Topcoat: High-performance architectural latex (semigloss).
- B. Exposed Galvanized-Metal Substrates:
 - 1. High-Performance Architectural Latex System: MPI INT 5.3M.

- a. Prime Coat: Waterborne galvanized-metal primer.
 - b. Intermediate Coat: High-performance architectural latex matching topcoat.
 - c. Topcoat: High-performance architectural latex (satin) and (semigloss), where indicated.
- C. Gypsum Board Substrates:
 - 1. High-Performance Architectural Latex System: MPI INT 9.2B.
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate Coat: High-performance architectural latex matching topcoat.
 - c. Topcoat: High-performance architectural latex (eggshell) and (satin), where indicated.
- D. Composite Siding Substrates:
 - 1. High-Performance Architectural Latex System: MPI
 - a. Prime Coat: Exterior masonry primer/sealer.
 - b. Intermediate Coat: High-performance architectural latex matching topcoat.
 - c. Topcoat: High-performance architectural latex (flat) and (satin), where indicated.

END OF SECTION 099120
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of wood finishes on the following substrates:
 - 1. Exterior Substrates:
 - a. Exposed dimension lumber (rough carpentry).
 - b. Dressed lumber (finish carpentry).
 - 2. Interior Substrates:
 - a. Dressed lumber (finish carpentry).
- B. Related Sections include the following:
 - 1. Division 09 Section "Staining and Transparent Finishing" for surface preparation and application of standard paint systems on exterior and interior substrates.
 - 2. Division 09 Section "High-Performance Coatings" for special-use coatings.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
 - 1. Submit Samples on representative samples of actual wood substrates, 8 inches square.
 - 2. Label each Sample for location and application area.

1.3 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in its "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and finish systems indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply exterior finishes in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Benjamin Moore & Co.
 2. Cabot Incorporated, Samuel.
 3. Columbia Paint & Coatings.
 4. Coronado Paint.
 5. ICI Paints.
 6. Kelly-Moore Paints.
 7. M.A.B. Paints.
 8. Porter Paints.
 9. PPG Architectural Finishes, Inc.
 10. Sherwin-Williams Company (The)

2.2 MATERIALS, GENERAL

- A. Material Compatibility:
 1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
- B. Stain Colors: As indicated in specification Section 099001 "COLORS" and alternate and additional colors as approved by the Contracting Officer.

2.3 WOOD FILLERS

- A. Wood Filler Paste: MPI #91.
 1. VOC Content: E Range of E1.

2.4 PRIMERS AND SEALERS

- A. Wood Preservative: MPI #37.

2.5 STAINS

- A. Exterior Semitransparent Stain (Solvent Based): MPI #13.
- B. Interior Wood Stain (Semitransparent): MPI #90.

2.6 POLYURETHANE FINISHES

- A. Two-Component Aliphatic Polyurethane (Clear): MPI #78.
- B. Moisture-Cured Clear Polyurethane (Gloss): MPI #31.

2.7 VARNISHES

- A. Exterior Marine Spar Varnish (Gloss): MPI #28, Gloss Level 7.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 - 1. Maximum Moisture Content of Wood Substrates: 15 percent when measured with electronic moisture meter.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes.
 - 3. Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 4. Beginning application of finish system constitutes Contractor's acceptance of substrate and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 - 1. After completing finishing operations, reinstall items that were removed; use workers skilled in the trades involved. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Remove surface dirt, oil, or grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
 - 3. Countersink steel nails, if used, and fill with putty tinted to final color to eliminate rust leach stains.
- D. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for finish and substrate indicated.
 - 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Contracting Officer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Exposed Rough Carpentry Substrates:

1. Varnish Over Semitransparent Stain System: MPI EXT 6.2E.
 - a. Stain Coat: Exterior semitransparent stain (solvent based).
 - b. Three Finish Coats: Exterior marine spar varnish (gloss).

B. Finish Carpentry Substrates:

1. Varnish Over Semitransparent Stain System: MPI EXT 6.3E.
 - a. Stain Coat: Exterior semitransparent stain (solvent based).
 - b. Three Finish Coats: Exterior varnish (marine spar, high gloss).

END OF SECTION 099300

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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Steel.
 - b. Galvanized metal.
- B. Related Sections include the following:
 - 1. Division 05 Sections for galvanizing exterior steel and preparation for primers specified in this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of finish-coat product indicated.
- C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.

1.3 QUALITY ASSURANCE

- A. Master Painters Institute (MPI) Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and coating systems indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.5 PROJECT CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.6 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Material Compatibility:
 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 2. Provide products of same manufacturer for each coat in a coating system.
- B. Colors: Bronze to match Aluminum Cladding, as Selected by COR from Manufacturer's full range.

2.2 METAL PRIMERS

- A. Rust-Inhibitive Primer (Water Based): MPI #107.
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Columbia Paint & Coatings; Professional, Metal Prime, 05-255-PP.
 - b. ICI Paints; Devoe Coatings, Devflex TDM Flat Int/Ext W.B. Primer, 4020.
 - c. PPG Architectural Finishes, Inc.; Pitt-Tech, Rust Inhibitive Primer (W.B.), 90-712.
 - d. Approved equal.

2.3 WATER-BASED, LIGHT-INDUSTRIAL COATINGS

- A. Eggshell, Water-Based, Light-Industrial Coating: MPI #110-G3.
 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Columbia Paint & Coatings; High Performance, Acry-Shield Eggshell Enamel, 05-265.
 - b. ICI Paints; Devoe Coatings, Devflex 4210.
 - c. Porter Paints; Porter Guard, DTM Acrylic Satin Enamel, 2805.
 - d. Sherwin Williams; Duration Exterior Latex Satin, K33 Series.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Wood: 15 percent.
 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 3. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

4. Coating application indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove plates, machined surfaces, and similar items already in place that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.
 1. After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.
- C. Clean substrates of substances that could impair bond of coatings, including dirt, oil, grease, and incompatible paints and encapsulants.
 1. Remove incompatible primers and reprime substrate with compatible primers as required to produce coating systems indicated.
- D. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promotes adhesion of subsequently applied coatings.
- E. Concrete and Asphalt Substrates: Remove release agents, curing compounds, efflorescence, grease, oil and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions. Do not apply traffic striping paints until 30 days after the placement of the final pavement surface.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions.
 1. Use applicators and techniques suited for coating and substrate indicated.
 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed parts, otherwise inaccessible during painting.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.
- E. Pre-Oxidized Steel clear coating applicator is required to contact manufacturer's local representative prior to start of application of clear finish to receive application instructions and any necessary training. Ordering material is not considered notification. Verify steel is dry prior to commencing application. Spray or roller-apply in accordance with manufacturer's printed instructions. Apply in multiple thin coats (1 – 2 mils per coat) with as many coats as are required to cover "peaks" that naturally occur in the texture of the oxidized finish. Do not apply in thick coats. Coatings that are not satisfactory are to be removed and reapplied at Contractor's expense.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Contracting Officer, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.5 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates, painted:

1. Water-Based, Light-Industrial Coating System:

- a. Prime Coat: Rust-inhibitive primer, (water based), MPI #107.
- b. Intermediate Coat: Water-based, light-industrial coating, MPI #110, gloss matching topcoat.
- c. Topcoat: Water-based, light-industrial coating, MPI #110-G3.

END OF SECTION 099600

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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 101400 - EXTERIOR SIGNS

PART 1 - GENERAL

1.1 SUMMARY

- A. This item shall consist of furnishing and installing signs as shown on the Drawings. The location for sign installations shall be as shown on the Drawings and as staked by the Contracting Officer in the field. The contractor shall furnish all posts, concrete, signs, and hardware required to complete the full installation.

1.2 SUBMITTAL

- A. Sign List Submittal: The contractor shall submit a list of signs proposed for the project. The list shall include detailed drawings showing the size of the sign, size of letters, colors, materials, sign texts, and location for installation. The Contracting Officer shall approve the submitted list, prior to the Contractor ordering the signs.

1.3 METHOD OF MEASUREMENT

- A. The quantity to be measured shall be the number of signs furnished, installed and accepted as shown in the Schedule of Items.
- B. Double signs on single-post installation will be considered as one installation. Signs that require more than one post to be considered as one installation.

PART 2 - PRODUCTS

2.1 SIGN PANELS

- A. General:
 - 1. Sign panels shall be panels of one-piece construction.
 - 2. Signs shall conform to current editions of the Manual of Uniform Traffic Control Devices (MUTCD) and the Forest Service Manual - EM 7100-15, Sign and Poster Guidelines for the Forest Service.
- B. Sheeting
 - 1. 100% heat activated retro-reflective sheeting material that conforms to AASHTO M 268 and ASTM D4956.
 - 2. Sheeting shall be High Intensity Type III or Type IV.
- C. Aluminum Panels:
 - 1. Shall be fabricated using 100% heat activated retro-reflectorized material.
 - 2. Shall be furnished with predrilled holes for installation.
 - 3. All sign sheets and plates shall meet the requirements of ASTM B 209, alloy 6061-T6, or 5052-H38 and shall be of the minimum thickness shown below.

Sign Width (inches)	Sheet Aluminum Thickness (inches)
Less than 8	0.022
8-12	0.040
13-19	0.063
20-30	0.080
31-48	0.100
over 48	0.125

2.2 POSTS

2.3 FASTENER BOLTS

- A. Vandal-Proof Bolts and hardware shall be galvanized or cadmium plated steel. Bolts shall be 5/16" carriage bolts. Nuts installed with wood posts shall be NTPAFN fluted nuts. Nuts installed with tubular steel posts shall be vandal-proof tufnuts or approved equal. A known supplier is Intermountain Traffic Safety, West Valley City, Utah, phone (801) 972-6515.

2.4 CONCRETE

- A. Concrete for installing sign posts shall conform to the requirement of Section 033000 or 033020.

2.5 SIGN BRACES

- A. All sign braces shall be made of aluminum alloy 6061-T6 and shall be a minimum 1/4" thick.
- B. Bolts shall be 3/8"X1" Galvanized steel w/ stainless steel and nylon washers for attaching brace to sign and 3/8"X3" Galvanized lag bolts with stainless steel and neoprene washers for attaching brace to post.

PART 3 - EXECUTION

3.1 POST SETTING

- A. Post holes not larger than 18-inch diameter shall be excavated to a depth as shown on the drawings. Backfill shall be hand tamped around the wood posts so as to make the post solid and plumb. Any loose posts shall be removed and re-installed. Concrete shall be used to backfill tubular steel posts as shown on the drawings.

3.2 SIGN MOUNTING

- A. Signs shall be mounted as shown on the drawings. Bolt holes shall be neatly drilled in the signs so as to prevent splintering and drilling through letters or delaminate sheathing. Sign face sheathing or coverings shall not be broken

3.3 GRADING AND CLEANUP

- A. The area around the post shall now be graded to the desired contour. When the installation is completed, the general area shall be cleaned up by removing all debris and material not utilized.

END OF SECTION

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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 101401 - BUILDING INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Panel signs.
- B. Related Sections include the following:
 - 1. Division 22 Sections for labels, tags, and nameplates for plumbing systems and equipment.
 - 2. Division 23 Sections for labels, tags, and nameplates for HVAC systems and equipment.
 - 3. Division 26 Sections for labels, tags, and nameplates for electrical equipment.
 - 4. Division 26 Section "Interior Lighting" for illuminated Exit signs.

1.2 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
 - 1. Polycarbonate sheet.
 - 2. Die-cut vinyl characters and graphic symbols. Include representative samples of available typestyles and graphic symbols.
- D. Sign Schedule: Use same designations indicated on Drawings.

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.
- B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.5 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

1.6 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
 - 1. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
 - 2. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
 - 3. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
 - 4. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
 - 5. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
- B. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 PANEL SIGNS: SEE DRAWINGS FOR PARTICULARS

2.3 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.4 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
 - 1. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
 - 2. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
1. Two-Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
 2. Hook-and-Loop Tapes: Mount signs to smooth, nonporous surfaces.
 3. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
 4. Shim Plate Mounting: Provide 1/8-inch-thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
 5. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
 6. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.
- C. Dimensional Characters: Mount characters using standard fastening methods to comply with manufacturer's written instructions for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
1. Projected Mounting: Mount characters at projection distance from wall surface indicated.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Government.

END OF SECTION 101400

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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 101550 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes toilet compartments and screens as follows:
 - 1. Type: Compact Laminate Toilet Compartments.
 - 2. Compartment Style: Overhead braced and floor anchored.
 - 3. Urinal Screens Style: Overhead braced and floor anchored.
- B. Related Sections include the following:
 - 1. Division 10 Section "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.2 SUBMITTALS

- A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.
- B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

1.3 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

1.4 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 LAMINATE TOILET PARTITION UNITS

- A. Materials: Toilet partitions shall be constructed of Compact laminate material, which is composed of 3/4" thick solidly fused plastic laminate with matte melamine surface. Material shall have a non-ghosting, graffiti resistant surface integrally bonded to core through a series of manufacturing steps requiring thermal and mechanical pressure. Edges of material shall be the same color as the surface.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Bobrick Washroom Equipment, Inc.
 - 2. General Partitions Mfg. Corp.

3. Sanymetal; a Crane Plumbing company.
 4. WilsonArt
 5. COR Approved equal.
- C. Basis of Design: Bobrick 1080 Series Toilet Partitions, Toilet Partition System or COR approved equal.
1. Color: As noted on plans
 2. Scratch, Dent, Moisture and impact resistant
 3. 25 year limited warranty
 4. Finish Thickness:
 - a. Stiles and doors shall be 3/4"
 - b. Panels and benches shall be 1/2"
- D. Toilet-Enclosure Style: Floor to ceiling anchored.
- E. Urinal-Screen Style: **Overhead** Floor to ceiling anchored.
- F. Door, Panel, Screen, and Pilaster Construction: material. Provide minimum 3/4-inch- thick doors and pilasters and minimum 1/2-inch-thick panels.
- G. Urinal-Screen Post: Manufacturer's standard post design of 1-3/4-inch- square, aluminum tube with satin finish; with shoe and sleeve (cap) matching that on the pilaster.

2.2 UNIT ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
1. Material:
 - a. All hardware to be 18-8, type-304 stainless steel with satin finish.
 2. Hinges:
 - a. Cam shall be adjustable in the field to permit door to be fully closed or partially open when compartment is unoccupied.
 - b. Hinges shall be attached to door and stile by theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts.
 - c. Fasteners secured directly into the core are not acceptable.
 - d. Door shall be furnished with two 11-gauge (3mm) stainless steel door stop plates with attached rubber bumpers to resist door from being kicked in/out beyond stile.
 - e. Door stops and hinges shall be secured with stainless steel, pin-in-head Torx machine screws into threaded brass inserts.
 - f. Threaded brass inserts shall withstand a direct pull force exceeding 1,500 lbs per inser
 3. Latch
 - a. Sliding door latch shall be 14-gauge (2mm) and shall slide on nylon track.
 - b. Sliding door latch shall require less than 5-lb force to operate. Twisting latch operation will not be acceptable.
 - c. Latch track shall be attached to door by machine screws into factory-installed threaded brass inserts.
 - d. Threaded brass inserts shall be factory installed for door hinge and latch connections and shall withstand a direct pull exceeding 1,500 lbs. per insert.
 - e. Through-bolted, stainless steel, pin-in-head Torx sex bolt fasteners shall be used at latch keeper-to-stile connections and shall withstand direct pull force exceeding 1,500 lbs. per fastener.
 4. Door Bumper:
 - a. Manufacturer's standard rubber-tipped bumper at out-swinging doors.
 5. Door Pull:

- a. Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- 6. Mounting Brackets
 - a. Mounting Brackets shall be constructed of stainless steel and shall be mounted inside compartment.
 - b. Fasteners at locations connecting panels-to-stiles shall utilize through-bolted, stainless steel, pin-in-head Torx sex bolt fasteners. Through-bolted fasteners shall withstand direct pull force exceeding 1,500 lbs. per fastener.
 - c. Wall mounted urinal screen brackets shall be 11 gauge (3 mm) double thickness
 - d. Leveling Device shall be 7-gauge, 3/16" (5mm) hot rolled steel bar; chromate-treated and zinc-plated; throughbolted to base of solid color reinforced composite stile.
 - e. Stile Shoe shall be one-piece, 4" (102mm) high, type-304, 22-gauge (0.8mm) stainless steel with satin-finish.
 - f. Top shall have 90° return to stile. Shoe will be composed of one-piece of stainless steel and capable of being fastened (by clip) to stiles starting at wall line.
 - g. Headrail (Overhead-Braced) shall be satin-finish, extruded anodized aluminum (.065"/1.65mm thick) with antigrip profile.

2.3 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.
- C. Doors: Unless otherwise indicated, provide 24-inch-wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch between pilasters and panels and not more than 1 inch between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING AND CLEANING

- A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

- B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 101550

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 102239 - FOLDING PANEL PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manually operated, acoustical panel partitions.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For operable panel partitions.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Indicate stacking and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.
 - 3. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.
- C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

1.8 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included at the contract unit price for items shown on the Schedule of Items.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the partition panels will remain in place without separation of any parts from the system when subjected to the seismic forces specified."
- B. Acoustical Performance: Provide operable panel partitions tested by a qualified testing agency for the following acoustical properties according to test methods indicated:
 - 1. Sound-Transmission Requirements: Operable panel partition assembly tested for laboratory sound-transmission loss performance according to ASTM E 90, determined by ASTM E 413, and rated for not less than the STC indicated.
- C. Fire-Test-Response Characteristics: Provide panels with finishes complying with one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84 or UL 723; testing by a qualified testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

2.2 OPERABLE ACOUSTICAL PANELS

- A. Operable Acoustical Panels: Partition system, including panels, seals, finish facing, suspension system, operators, and accessories.
 - 1. Hufcor 642 series operable partition with passage door or a government approved equal.
- B. Panel Operation: Manually operated, paired , continuously hinged panels.
- C. Panel Construction: As required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.
- D. Dimensions: Fabricate operable acoustical panel partitions to form an assembled system of dimensions indicated and verified by field measurements.
- E. STC: Not less than 52.
- F. Panel Materials:
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
 - 2. Steel Frame: Steel sheet, manufacturer's standard thickness.
 - 3. Steel Face/Liner Sheets: Tension-leveled steel sheet, manufacturer's standard thickness.
- G. Panel Closure: Manufacturer's standard.
- H. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

2.3 SEALS

- A. General: Provide seals that produce operable panel partitions complying with performance requirements and the following:
 - 1. Seals made from materials and in profiles that minimize sound leakage.
 - 2. Seals fitting tight at contact surfaces and sealing continuously between adjacent panels and between operable panel partition perimeter and adjacent surfaces, when operable panel partition is extended and closed.

- B. Horizontal Bottom Seals: PVC-faced, mechanical, retractable, constant-force-contact seal exerting uniform constant pressure on floor when extended, ensuring horizontal and vertical sealing and resisting panel movement.
 - 1. Mechanically Operated for Acoustical Panels: Extension and retraction of bottom seal by operating handle or built-in operating mechanism, with operating range not less than 1-1/2 inches between retracted seal and floor finish.

2.4 PANEL FINISH FACINGS

- A. General: Provide finish facings for panels that comply with indicated fire-test-response characteristics and that are factory applied to operable panel partitions with appropriate backing, using mildew-resistant nonstaining adhesive as recommended by facing manufacturer's written instructions.
 - 1. Color/Pattern: As selected by COR from manufacturer's full range.
- B. Fabric Wall Covering: Manufacturer's standard fabric, from same dye lot, treated to resist stains.
- C. Cap-Trimmed Edges: Protective perimeter-edge trim with tight hairline joints concealing edges of panel and finish facing.

2.5 SUSPENSION SYSTEMS

- A. Tracks: Steel or aluminum with adjustable steel hanger rods for overhead support, designed for operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.
- B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.
- C. Track Intersections, Switches, and Accessories: As required for operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.
- B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed in area of partition installation.
- C. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.
- D. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.
- E. Light-Leakage Test: Illuminate one side of partition installation and observe vertical joints and top and bottom seals for voids. Adjust partitions for alignment and full closure of vertical joints and full closure along top and bottom seals.

3.2 ADJUSTING

- A. Verify that safety devices are properly functioning.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Government's maintenance personnel to adjust, operate, and maintain operable panel partitions.

END OF SECTION 102239

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 102800 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Public-use washroom accessories.
 - 2. Custodial accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- B. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Contracting Officer.

1.4 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.5 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- D. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- E. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A & J Washroom Accessories, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.
4. Approved equal.

B. Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: Refer to Schedule on Drawings.

C. Liquid-Soap Dispenser:

1. Basis-of-Design Product: Refer to Schedule on Drawings.

D. Grab Bar:

1. Basis-of-Design Product: Refer to Schedule on Drawings.
2. Mounting: Flanges with concealed fasteners.

E. Mirror Unit:

1. Basis-of-Design Product: Refer to Schedule on Drawings.
2. Type: Stainless-steel mirror frame.

2.3 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.
3. Approved equal.

B. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.4 CUSTODIAL ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A & J Washroom Accessories, Inc.
2. Bobrick Washroom Equipment, Inc.
3. Bradley Corporation.
4. Approved equal.

B. Mop and Broom Holder:

1. Basis-of-Design Product: Refer to Schedule on Drawings.

C. Utility Shelf:

1. Basis-of-Design Product: Refer to Schedule on Drawings.
2. Description: With exposed edges turned down not less than 1/2 inch and supported by two triangular brackets welded to shelf underside.
3. Size: 24 inches long by 5 inches deep.
4. Material and Finish: Not less than nominal 0.05-inch- thick stainless steel, No. 4 finish (satin).

2.5 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Contracting Officer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 105201 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets for the following:
 - a. Portable fire extinguishers.

1.2 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
 - 1. Fire Extinguishers: Include rating and classification.
 - 2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FMG.
- D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.4 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

1.5 SEQUENCING

- A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Six years from date of Substantial Completion.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:
 - 1. Sheet: ASTM B 209.
 - 2. Extruded Shapes: ASTM B 221.
- C. Stainless-Steel Sheet: ASTM A 666, Type 304.
- D. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).
- E. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 PORTABLE FIRE EXTINGUISHERS

- A. Manufacturers:
 - 1. General Fire Extinguisher Corporation.
 - 2. JL Industries, Inc.
 - 3. Larsen's Manufacturing Company.
 - 4. Approved equal.
- B. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet indicated.
 - 1. Valves: Manufacturer's standard.
 - 2. Handles and Levers: Manufacturer's standard.
 - 3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- C. Multipurpose Dry-Chemical Type in Steel Container: 3-A:40-B:C, 6-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 FIRE-PROTECTION CABINET

- A. Manufacturers:
 - 1. JL Industries, Inc.
 - 2. General Fire Extinguisher Corporation.
 - 3. Larsen's Manufacturing Company.
 - 4. Approved equal.
- B. Basis of Design: Cosmopolitan Series by JL Industries
 - 1. Model #: 1036F13
 - 2. Door Finish: #6 Satin Stainless Steel
 - 3. Door Glazing: 10 Clear Acrylic
- C. Cabinet Type: Suitable for fire extinguisher.
- D. Cabinet Construction: Fire-Rated.
- E. Cabinet Material: Enameled-steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.

- F. Semirecessed Cabinet as shown on the drawings: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
- G. Cabinet Trim Material: Steel sheet.
- H. Door Material: Steel sheet.
- I. Door Style: Fully glazed panel with frame.
- J. Door Glazing: Tempered float glass (clear).
- K. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide manufacturer's standard hinge permitting door to open 180 degrees.
- L. Accessories:
 - 1. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
 - 2. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 - 3. Door Lock: Cylinder lock, keyed alike to other cabinets.
 - 4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Contracting Officer.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER"
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Pressure-sensitive vinyl letters.
 - 3) Lettering Color: Black.
 - 4) Orientation: Horizontal.
- M. **Finishes:**
 - 1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.
 - 2. Steel: Baked enamel.
 - a. Color and Texture: As selected by Contracting Officer from manufacturer's full range.

2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material.
 - a. Provide factory-drilled mounting holes.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 - 2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 STEEL FINISHES

- A. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond using manufacturer's standard methods.
- B. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
 - 1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- C. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed.
- B. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for recessed and semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 **INSTALLATION**

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
 - 1. Fire-Protection Cabinets: Install as shown on the drawings.
- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 105201

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 113100 - APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cooking appliances.
 - 2. Refrigeration appliances.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.3 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
 - 1. Amana; a division of Whirlpool Corporation.
 - 2. BOSCH Home Appliances.
 - 3. Electrolux Home Products (Frigidaire).
 - 4. General Electric Company (GE).
 - 5. General Electric Company (Hotpoint).
 - 6. Jenn-Air; a division of Whirlpool Corporation.
 - 7. KitchenAid; a division of Whirlpool Corporation.
 - 8. LG Appliances.
 - 9. Maytag; a division of Whirlpool Corporation.
 - 10. Samsung.
 - 11. Sears Brands LLC (Kenmore).
 - 12. Sharp Electronics Corp.
 - 13. Whirlpool Corporation.

2.2 MICROWAVE OVENS

- A. Microwave Oven:
 - 1. Basis-of-Design Product: Sharp 1.5 Cu. ft Model #SMC1442CS
 - 2. Mounting: Countertop
 - 3. Capacity: 1.4 cu. ft.
 - 4. Material: Manufacturer's standard.

2.3 REFRIGERATOR

- A. Refrigerator/Freezer Two-door refrigerator/freezer with freezer on top and complying with AHAM HRF-1.
 - 1. Basis-of-Design Product: Sears/Kenmore 51123 Side by Side Refrigerator/Freezer
 - 2. Storage Capacity:
 - a. Total Freezer/Refrigeration Compartment Volume: **25 cu. ft.**
 - b. Ice maker and water dispenser included
 - c. Finish: Stainless Steel
 - 3. General Features:
 - a. Interior light in refrigeration compartment.
 - b. Automatic defrost.
 - c. Interior light in freezer compartment.
 - d. Automatic icemaker and storage bin.
 - 4. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
 - 5. Front Panel(s): Manufacturer's standard.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
- B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
- C. Utilities: See Divisions 22 and 26 for plumbing and electrical requirements.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
 - 2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After installation, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
- C. Prepare test and inspection reports.

END OF SECTION 113100
December 2018

USDA FOREST SERVICE, R4

FLAMING GORGE RANGER DISTRICT ADDITION

SECTION 122413 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated roller shades with single rollers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. BTX Window Automation Inc.
 2. Draper Inc.
 3. Hunter Douglas Contract.
 4. Rollease Acmeda, Inc.

5. [Springs Window Fashions; SWFcontract.](#)
6. [TimberBlindMetroShade.](#)

- B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 1. Chain-Retainer Type: Clip, jamb mount.
 2. Spring Lift-Assist Mechanisms: Provide for shadebands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criterion is more stringent.
- C. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
- D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- E. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- F. Shadebands:
 1. Shadeband Material: Light-filtering fabric AND Light-blocking fabric (For Conference and Break room only.)
 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
- G. Installation Accessories:
 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
 2. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
 3. Endcap Covers: To cover exposed endcaps.
 4. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
 5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 6. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
 7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
 8. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
 1. Source: Roller shade manufacturer.

2. Type: PVC-coated fiberglass.
3. Weave: Mesh.
4. Thickness: 0.017 inches.
5. Weight: 5 oz/ sq/yd
6. Roll Width: 96 or more inches
7. Openness Factor: 5 percent.
8. Color: As selected by COR from manufacturer's full range.

C. Light-Blocking Fabric: Fore Conference Breakroom only. Opaque fabric, stain and fade resistant.

1. Source: Roller shade manufacturer.
2. Type: Fiberglass textile with PVC film bonded to both sides.
3. Thickness: 0.02 in
4. Weight: 8oz./sq. yd..
5. Roll Width: 96 or more inches
6. Features: Washable.
7. Color: As selected by COR from manufacturer's full range.

2.4 ROLLER SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F :

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch , plus or minus 1/8 inch.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible.

PART 3 - EXECUTION

3.1 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

C. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

D. Replace damaged roller shades that cannot be repaired, in a manner approved by COR, before time of Substantial Completion.

END OF SECTION 122413
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 124813 - ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes recessed floor mats and frames.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide Heavy Duty Interior and Exterior rated floor mats and frames.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for foot grilles and frames.
- B. Samples for Initial Selection: For each type of product involving color selection.
- C. Maintenance Data: For entrance mats and frames to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain foot grilles and frames through one source from a single manufacturer.
- B. Accessibility Requirements: Provide installed foot grilles that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and Sections 302 and 303 in ICC A117.1.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Indicate measurements on Shop Drawings.

1.6 COORDINATION

- A. Coordinate size and location of adjacent materials, required demolition and reconstruction required to interface with new foot grilles and frames.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Pawling Corporation; Architectural Products Division, Drain-Well Series, #RG-250-AA, Bristle Filament #519 Near Black, or a comparable product by one of the following acceptable to Contracting Officer:
 - 1. ARDEN Architectural Specialties, Inc.
 - 2. Balco, Inc.
 - 3. J. L. Industries, Inc.
 - 4. Approved Equal.

2.2 MATERIALS

- A. Aluminum - ASTM B 221, alloys 6063-T5, 6063-T6 for extrusions.

- B. General: Provide manufacturer's standard entrance floor mat and frame assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.
- C. Tread Rails: Exposed hinge rail connectors shall be perforated vinyl hinge with extruded 6063-T6 aluminum tread rails.
- D. AL - Aluminum Block-out Frame shall be a 3/4"(19.1mm) deep recessed frame in 6063-T5 aluminum alloy with 1/4"(6.4mm) wide exposed surface.
 - 1. Installer shall use recommended latex screed to ensure level base.
- E. Tread Bristle Fillament Insert shall meet the Carpet and Rug Institute's standard for indoor air quality. Anti-static carpet fiber shall contain antimicrobial additive and be treated with manufacturer's standard protective coating to reduce soiling.

2.3 FABRICATION

- A. Shop fabricate entrance mats and frames to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each mat as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes.
- B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.4 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.5 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0.010 mm or thicker).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of foot grilles and frames.
- B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before foot grille and frame and drain pan installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed entrance mats and frames to comply with manufacturer's written instructions at locations indicated and with top of foot grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set entrance mats tops at height for most effective cleaning

action. Coordinate top of entrance mat surfaces with doors that swing across grilles to provide clearance under door.

3.3 PROTECTION

- A. After completing frame installations, provide temporary filler of plywood or fiberboard in foot-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124813

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of each type of site furnishings is indicated as shown on the drawings.
- B. Type of furnishings includes:
 - 1. Bicycle Rack
 - 2. Wood Plank Picnic Table

1.2 SUBMITTALS

- A. Product Data: For each product specified.
 - 1. Submit manufacturer's data and installation instruction for each type of furnishings, including anchorage and accessory items.

1.3 MEASUREMENT AND PAYMENT

- A. The quantity to be measured shall be the number of each (EA) type of furnishing listed below that is fabricated, delivered, installed and accepted as indicated in the SCHEDULE OF ITEMS.
 - 1. Payment for Bicycle Rack includes rack, hardware and installation.
 - 2. Payment for Wood Plank Picnic table includes one-piece moveable table.

PART 2 - PRODUCTS

2.1 BICYCLE RACK

- A. Bicycle racks shall be "Saddleback" model / style: SRP/G-7 concrete surface mounted with bolt down base plates using anchoring system ANC 3-4 as manufactured by R.J. Thomas Mfg. Co., Inc. Cherokee, IA 51012 Ph: 800-762-5002 F: 712-225-5796 or approved equal.
- B. Anchoring system: Anchor system shall be model ANC 3-4 as manufactured by Pilot Rock of approved equal.
- C. Subject to compliance with requirements manufacturers offering bicycle rack which may be incorporated in the work includes, but are not limited to the following:
 - 1. Brainir International – "RB'07"
 - 2. Columbia Cascade Co. – "CycLoops"
 - 3. Bike Security Rack Co. – "Bike-Stanchions"

2.2 WOOD PLANK PICNIC TABLE

- A. Tabletops and Seats: Tabletops and seats shall be untreated #1 grade Southern Yellow Pine 2" by 10" nominal sized lumber planks, S4S. Kiln dried to a moisture content of 19% or less. Planks that are twisted or warped shall be rejected.
- B. Frame: All welded 2-3/8" O.D. steel pipe. Top/seat mounting angles are 2"x2"x3/16" steel angles. Frames supported by diagonal braces of 1-5/16" O.D. steel pipe attached to center channel. Frames are welded into a single piece structure for strength and easy assembly. All 3/8" diameter galvanized carriage bolt fasteners. Supports and hardware shall be a one-piece moveable table AS SHOWN ON THE DRAWINGS. Prior to assemble, all channel supports shall be powder coated brown.
- C. Finish: Brown powder coat finish (in place of standard hot dip galvanized finish).

- D. Length: 8 feet long.
- E. 8-Foot One-Piece Moveable Picnic Table: The table shall be manufactured by Pilot Rock Model: WXT/CW-8TP with table top end metal clamps as manufactured by R. J. Thomas Manufacturing Co., Inc., POB 946, Cherokee, IA, 51012, phone no. 1-(712)-225-5115 or 1-(800)-762-5002, or an approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION – BICYCLE RACK

- A. Install bicycle racks with in-ground mounting as recommended by manufacturer and as indicated on the drawings.
- B. Install bicycle racks plumb.

3.2 INSTALLATION – WOOD PLANK PICNIC TABLES

- A. Install tables on a flat finished surface according to the locations indicated on the site plans or as directed by the contracting officer.
- B. Ensure installed tables provide 4-feet clearance around all sides for circulation and accessibility requirements.
- C. Cleanup: When a unit is completed, the area shall be cleaned up of false work, debris, and material not utilized.

END OF SECTION 129300

NOVEMBER 2018

USDA FOREST SERVICE, R4

FLAMING GORGE RANGER DISTRICT OFFICE ADDTION

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. [Advance Products & Systems, Inc.](#)
 2. [CALPICO, Inc.](#)
 3. [Metraflex Company \(The\).](#)
 4. [Pipeline Seal and Insulator, Inc.](#)
 5. [Proco Products, Inc.](#)

- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Carbon steel.
 - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Sections.
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Sections.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: PVC-pipe sleeves.
 - 5. Interior Partitions:
 - a. Piping Smaller Than NPS 6: PVC-pipe sleeves.

END OF SECTION 220517
NOVEMBER 2018

USDA FOREST SERVICE, R4

FLAMING GORGE RANGER DISTRICT OFFICE ADDTION

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Liquid-in-glass thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product certificates.
- C. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Flo Fab Inc.](#)
 - b. [Miljoco Corporation.](#)
 - c. [Palmer Wahl Instrumentation Group.](#)
 - d. [Tel-Tru Manufacturing Company.](#)
 - e. [Trerice, H. O. Co.](#)
 - f. [Weiss Instruments, Inc.](#)
 - g. [Winters Instruments - U.S.](#)
2. Standard: ASME B40.200.
3. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
4. Case Form: Straight unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
7. Window: Glass.
8. Stem: Aluminum and of length to suit installation.

- a. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [AMETEK, Inc.; U.S. Gauge.](#)
 - b. [Ashcroft Inc.](#)
 - c. [Ernst Flow Industries.](#)
 - d. [Flo Fab Inc.](#)
 - e. [Marsh Bellofram.](#)
 - f. [Miljoco Corporation.](#)
 - g. [Noshok.](#)
 - h. [Palmer Wahl Instrumentation Group.](#)
 - i. [REOTEMP Instrument Corporation.](#)
 - j. [Tel-Tru Manufacturing Company.](#)
 - k. [Trerice, H. O. Co.](#)
 - l. [Watts Regulator Co.; a div. of Watts Water Technologies, Inc.](#)
 - m. [Weiss Instruments, Inc.](#)
 - n. [WIKA Instrument Corporation - USA.](#)
 - o. [Winters Instruments - U.S.](#)
2. Standard: ASME B40.100.
3. Case: Liquid-filled Sealed type(s); cast aluminum or drawn steel; 6-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.

8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass ball, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- G. Install valve and snubber in piping for each pressure gage for fluids.
- H. Install thermometers in the following locations:
 1. Inlet and outlet of each water heater.
 2. Inlets and outlets of each domestic water heat exchanger.
 3. Inlet and outlet of each domestic hot-water storage tank.
- I. Install pressure gages in the following locations:
 1. Building water service entrance into building.
- J. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
- K. Adjust faces of meters and gages to proper angle for best visibility.

3.2 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be the following:
 1. Industrial-style, liquid-in-glass type.
- B. Thermometers at inlets and outlets of each domestic water heat exchanger shall be the following:

1. Industrial-style, liquid-in-glass type.
- C. Thermometers at inlet and outlet of each domestic hot-water storage tank shall be the following:
 1. Industrial-style, liquid-in-glass type.
- D. Thermometers at inlet and outlet of each remote domestic water chiller shall be the following:
 1. Industrial-style, liquid-in-glass type.
- E. Thermometer stems shall be of length to match thermowell insertion length.

3.3 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F and 0 to 150 deg C.

3.4 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at discharge of each water service into building shall be the following:
 1. Liquid-filled, direct -mounted, metal case.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:
 1. Liquid-filled, direct -mounted, metal case.
- C. Pressure gages at suction and discharge of each domestic water pump shall be the following:
 1. Liquid-filled, direct -mounted, metal case.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Domestic Water Piping: 0 to 100 psi and 0 to 600 kPa.

END OF SECTION 220519

NOVEMBER 2018

USDA FOREST SERVICE, R4

FLAMING GORGE RANGER DISTRICT OFFICE ADDTION

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- #### A.
- Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- #### A.
- Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- #### B.
- Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
- #### C.
- For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- #### D.
- For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- #### E.
- Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- #### A.
- Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated - steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

USDA FOREST SERVICE, R4

FLAMING GORGE RANGER DISTRICT OFFICE ADDTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTAL

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch or Aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

- 7. Fasteners: Stainless-steel rivets or self-tapping screws.
- 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Piping Color-Coding: Painting of piping is specified in Division 09 Sections.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
 - 1. Domestic Water Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.
 - 2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Orange.
 - b. Letter Color: White.

END OF SECTION 220553

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDTION
SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Domestic recirculating hot-water piping.
 - 3. Sanitary waste piping exposed to freezing conditions.
 - 4. Storm-water piping exposed to freezing conditions.
 - 5. Roof drains and rainwater leaders.
 - 6. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. **Products:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.](#)
 - b. [Eagle Bridges - Marathon Industries; 225.](#)
 - c. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.](#)
 - d. [Mon-Eco Industries, Inc.; 22-25.](#)
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. PVC Jacket Adhesive: Compatible with PVC jacket.
1. **Products:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Dow Corning Corporation; 739, Dow Silicone.](#)
 - b. [Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.](#)
 - c. [P.I.C. Plastics, Inc.; Welding Adhesive.](#)
 - d. [Speedline Corporation; Polyco VP Adhesive.](#)
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. **Products:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.](#)
 - b. [Vimasco Corporation; 749.](#)
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. **Products:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.](#)
 - b. [Eagle Bridges - Marathon Industries; 550.](#)

- c. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.](#)
- d. [Mon-Eco Industries, Inc.; 55-50.](#)
- e. [Vimasco Corporation; WC-1/WC-5.](#)
- 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
- 3. Service Temperature Range: Minus 20 to plus 180 deg F.
- 4. Solids Content: 60 percent by volume and 66 percent by weight.
- 5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

- 1. Materials shall be compatible with insulation materials, jackets, and substrates.
- 2. Permanently flexible, elastomeric sealant.
- 3. Service Temperature Range: Minus 100 to plus 300 deg F.
- 4. Color: White or gray.
- 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. FSK and Metal Jacket Flashing Sealants:

- 1. **Products:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.](#)
 - b. [Eagle Bridges - Marathon Industries; 405.](#)
 - c. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.](#)
 - d. [Mon-Eco Industries, Inc.; 44-05.](#)
- 2. Materials shall be compatible with insulation materials, jackets, and substrates.
- 3. Fire- and water-resistant, flexible, elastomeric sealant.
- 4. Service Temperature Range: Minus 40 to plus 250 deg F.
- 5. Color: Aluminum.
- 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

- 1. **Products:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.](#)
- 2. Materials shall be compatible with insulation materials, jackets, and substrates.
- 3. Fire- and water-resistant, flexible, elastomeric sealant.
- 4. Service Temperature Range: Minus 40 to plus 250 deg F.
- 5. Color: White.
- 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
 - b. Vimasco Corporation; Elastafab 894.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 - 2. Adhesive: As recommended by jacket material manufacturer.
 - 3. Color: White.
 - 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- C. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - 1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
 - b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
 - c. RPR Products, Inc.; Insul-Mate.
 - 2. Sheet and roll stock ready for shop or field sizing.
 - 3. Finish and thickness are indicated in field-applied jacket schedules.
 - 4. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 - 5. Factory-Fabricated Fitting Covers:
 - a. Same material, finish, and thickness as jacket.
 - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - c. Tee covers.
 - d. Flange and union covers.
 - e. End caps.
 - f. Beveled collars.
 - g. Valve covers.
 - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. ABI, Ideal Tape Division; 370 White PVC tape.
 - b. Compac Corporation; 130.
 - c. Venture Tape; 1506 CW NS.
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. ABI, Ideal Tape Division; 488 AWF.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - c. Compac Corporation; 120.
 - d. Venture Tape; 3520 CW.
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.

2.10 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
1. Products: Subject to compliance with requirements, provide products by one of the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping and Seals.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, stainless steel.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C & F Wire.

2.11 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Engineered Brass Company.
 - b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing.
 - d. Plumberex.
 - e. Truebro; a brand of IPS Corporation.
 - f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Truebro; a brand of IPS Corporation.
 - b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.

- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a

- removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed sections of same material as straight segments of pipe insulation when available.
 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 4. Install insulation to flanges as specified for flange insulation application.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 Sections.
1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
1. Drainage piping located in crawl spaces.
 2. Underground piping.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water: Insulation shall be the following:
1. Mineral-Fiber, Preformed Pipe Insulation, Type I: See schedule on drawings.
- B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be the following:
1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- C. Sanitary Waste Piping Where Heat Tracing Is Installed: Mineral-fiber, preformed pipe insulation, Type I, 1-1/2 inches thick.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed: None.
- D. Piping, Exposed: PVC: 20 mils thick.

END OF SECTION 220719

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 221100 - WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section shall consist of furnishing and installing the following:
 - 1. Potable water distribution pipe and fittings.
- B. This Section shall also include the flushing, testing and disinfection of waterlines.
- C. Related Sections include the following:
 - 1. Section 024100 "Waste Material Disposal."
 - 2. Section 033020 "Concrete From Package Dry Mix for Minor Structures."
 - 3. Section 221102 "Curb Valves and Boxes."
 - 4. Section 312000 "Earthwork."

1.2 DEFINITIONS

- A. GSP: Galvanized Steel Pipe.
- B. HDPE: High Density Polyethylene plastic.
- C. NPWL: Non-potable waterline (includes sewerline).
- D. PVC: Polyvinyl chloride plastic.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Pipe and fittings.
- B. Plan for disposal of water used for testing and disinfection of waterlines.
- C. Water System Operations and Maintenance Manual.

1.4 QUALITY ASSURANCE

- A. All work is to be completed according to applicable Federal, State and Local codes. This work includes, but is not limited to, materials, installation, testing and disinfection
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. NSF Compliance:
 - 1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF-pw" on piping.
 - 2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.5 MINIMUM SYSTEM REQUIREMENTS

- A. Unless otherwise noted, the minimum working pressure for piping and specialties shall be 160 psig.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Protect stored piping from moisture and dirt. Elevate above grade.

- C. Protect flanges, fittings, and specialties from moisture and dirt.
- D. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Government or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify the Contracting Officer not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without the Contracting Officer's written permission.

1.8 COORDINATION

- A. Coordinate connection to existing waterlines with Contracting Officer.
- B. Verify piping materials, sizes, entry locations and pressure requirements are compatible with connection point.
- C. Coordinate other utility impacts.

1.9 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All waterlines, pipes, and fittings shall be new and unused, of the type, pressure rating or class, and size specified and as shown on the Drawings.

2.2 PIPES AND FITTINGS

- A. PVC: ASTM D 1785, Schedule 80; solvent-cemented joints.
 1. Solvent Cement: ASTM D 2564.
 2. Socket Fittings: PVC, Schedule 80, ASTM D 2467.
- B. PVC: ASTM D2241, SDR 26, 160 psig; elastomeric gasket joints.
 1. Solvent Cement: ASTM D 2564.
 2. Gaskets: ASTM F 477, elastomeric seal.
 3. Socket Fittings: PVC, made to match dimension ratio and pressure rating of PVC pipe.
- C. PVC, AWWA Pipe: AWWA C900, Class 150, with bell end with gasket, and with spigot end.
 1. Comply with UL 1285 for fire-service mains if indicated.
 2. PVC Fabricated Fittings: AWWA C900, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
 4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Gaskets: AWWA C111, rubber.
 5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. HDPE:

1. Pipe, AWWA C901:
 - a. Material Designation: PE 3408 resin
 - b. Material Classification: ASTM D1248
 - c. Minimum Cell Classification: ASTM D 3350, 345434C
 - d. Dimension Ratio and Minimum Pressure Rating: DR11, 160 psig
2. Fittings:
 - a. Molded HDPE Fittings: ASTM D 3350, PE 3408 resin, butt-fusion type, made to match HDPE pipe dimensions and class.
 - b. Insert Fittings: Not allowed.
 - c. Transition Fittings to non-HDPE Pipe: Approved by HDPE pipe manufacturer. Compression-type fittings are not allowed.
3. Pipe Larger than 2-inch Diameter: Provide in 40-foot lengths rather than in rolls.
4. Pipe and Fittings 4-inch Diameter and Larger: Conform to AWWA C906 in addition to above requirements.
5. Pipe Insulation: Urethane foam, 2-inch thick, wrapped around pipe.
 - a. Outer Jacket: 60-mil thick HDPE, ASTM D 3350, 345434C cell classification.

E. Galvanized Steel: ASTM A53, Schedule 40, threaded ends meeting ASME B1.20.1.

1. Fittings: Threaded, ASTM A 338.

2.3 PIPING SPECIALTIES

A. Dielectric Fittings: Combination of copper alloy and ferrous; threaded, solder, or plain end types; and matching piping system materials.

1. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar metals and ends with inside threads according to ASME B1.20.1.
2. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 160- or 300-psig minimum working pressure to suit system pressures.
3. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.
4. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F).
5. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig minimum working pressure at 225 deg F.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Section 312000 "Earthwork" for excavating, trenching, bedding, and backfilling.

3.2 PIPING INSTALLATION

- A. Construct the water system to the lines and grades shown or established in the field.
- B. Stake locations of waterlines as shown on the Drawings. Waterline location shall be approved by the Contracting Officer before installation.

- C. All waterline shall be graded to drain.
- D. All pipe, fittings, and appurtenances shall be handled and installed in strict conformance to the manufacturer's recommendations.
- E. Drains, valves, and other regulating and controlling devices shall be installed in the line where called for on the drawings.
- F. The interior of all pipe, fittings, and other accessories shall be kept as free as possible from dirt and foreign matter at all times. Each piece of line as it is laid shall be cleaned of all debris. When the pipeline has become dirty on the inside during shipment or storage, it shall be swabbed out by drawing a damp swab through the line before placing in trench. Care shall be exercised to keep all joining surfaces clean. Any pipe with contaminated or damaged joining surfaces, which cannot be satisfactorily cleaned or repaired, shall be discarded. Under no circumstances shall pipe be installed in water, and no pipe shall be installed when trench conditions or the weather is unsuitable for such work. At all times when work is not in progress, all open ends of the pipe and fittings shall be securely closed to the satisfaction of the Contracting Officer so that no trench water, rodents, earth, or other substance will enter the pipe or fittings.
- G. Any section of pipe already installed and found to be defective shall be removed and replaced with new pipe at the Contractor's expense.
- H. Water and Non-Potable/Sewer Line Crossings
 - 1. Potable and NPWL lines shall never be installed in the same trench.
 - 2. If a new line crosses below an existing line, the existing line shall be supported to prevent settling.
 - 3. Where waterlines intersect NPWLs or are within 10 horizontal feet of NPWLs, the following applies:
 - a. At least one of the pipes (either the waterline or NPWL) shall be constructed or reconstructed with 200 psi pipe or encased in a continuous sleeve with same rating. At crossing, extend 200 psi pipe or sleeve for a distance of 10 feet perpendicular distance from each side of the waterline. The waterline and NPWL pipes or sleeves shall be centered at the crossing so that the joints will be an equal distance and as far as possible from the crossing.
 - 1) Sleeves: Nominal sleeve diameter to be at least 3 inches larger than nominal diameter of pipe to be encased. Install end seals in annular space at each end of sleeves.
 - 2) In lieu of constructing or reconstructing the NPWL with pipe conforming to waterline requirements, the NPWL may be encased in concrete at least 6 inches thick around the pipe measured at the bell, for 10 feet each side of the waterline.
 - b. Construct according to applicable federal, state and local regulations, including Wyoming Department of Environmental Quality, "Water Quality Rules and Regulations, Chapter 11." The Contractor is responsible for obtaining and following these regulations.
 - c. Where applicable, state and local regulations supersede the above requirements.
- I. Culvert Crossings: Where waterline crosses a road culvert, adjust grade of waterline to provide a minimum of 12 inches of separation between the waterline and culvert, maintaining slope of waterline to drain.
- J. A minimum of one-foot separation shall be maintained between electric and waterlines in the same trench. Unless the electric conductors are in conduit the waterline shall be a minimum of one foot below the electric conductors.
- K. Bury piping with depth of cover over top at least 48 inches, with top at least 12 inches below level of maximum frost penetration.
- L. Cutting and Handling of Pipe
 - 1. Cutting of pipe for closure pieces or for other reasons shall be done in a neat manner by methods, which will not damage the pipe. The pipe and fittings shall be handled in such a manner as to insure delivery and final placement in good, undamaged condition. Particular care shall be exercised not to injure the pipe surfaces or coatings. Damaged pipe shall not be used in the work.
- M. Laying Pipe

1. No pipe shall be placed in the trench until the Contracting Officer has approved the trench and bedding.
2. Pipes shall be placed true to the lines and grades shown on the Drawings and as specified. Complete water system shall be constructed to drain by gravity to drains for seasonal shutdown. Waterlines shall be constructed to drain at a minimum grade of 1%. Waterlines not meeting this requirement shall be removed by the Contractor and replaced at no cost to the Government.
3. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel.
4. Backfill the pipe within 24 hours after installing the pipe in the trench, leaving the joints and one foot of pipe on each side of each joint exposed until testing is complete.
5. When work is not in progress, securely close open ends of pipe and fittings.
6. When high density polyethylene or solvent weld joint pipe is used, it shall be weaved in the trench to provide horizontal slack in the line for expansion and contraction.
7. High density polyethylene pipe shall be allowed to cool to within 20°F of the shaded trench bottom temperature before backfilling.
8. When pipes are installed in a structure or utility box, they shall be adequately supported.
9. Use proper fittings in order to follow the required line and grades and to avoid excessive curvature. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed the manufacturer's recommended maximum joint deflection or curvature for their pipe.
10. When more than one pipeline is in the same trench, the pipes shall be separated by at least eight horizontal inches, or as shown on the Drawings.
11. Bends that result in joint tension or permanent pipe deformation are prohibited.
12. Pipelines may be relocated slightly, if necessary, to avoid existing obstacles. However, the required slopes must be maintained.

N. Pipe Joints

1. Joints shall be made, using jointing materials and applied with the proper accessories, in accordance with the manufacturer's instructions. Completed joints shall be watertight, and capable of passing the required hydrostatic testing. If pipe and fittings are assembled with a lubricant, it must be nontoxic.
2. Dissimilar Joints: Connections between two dissimilar pipes or fittings shall be installed in manner recommended by the pipe manufacturer and approved by the Contracting Officer. Use adapters compatible with both piping materials, outer diameters and system working pressure.
 - a. For HDPE pipelines:
 - 1) Use HDPE/GSP transition fittings for connections to galvanized steel pipe.
 - 2) Use HDPE/PVC transition fittings for connections to PVC pipe.
 - b. For other situations, use fittings to suit the actual conditions.
 - c. Compression-type fittings are not allowed.
3. Threaded Metal Joints:
 - a. Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to fitting and valve ends into which pipes are being threaded.
 - b. Exposed threaded pipe joints on galvanized steel pipe shall be painted with mastic following the manufacturer's application procedures.
 - c. Field cut ends shall be squared off by grinding or filing; ends shall be reamed with all chips and flakes removed.
 - d. Field cut threads or machined joints shall be made with sharp tools to sharp finished ends.
4. HDPE Heat-Fusion Joints
 - a. According to ASTM D 2657 and piping manufacturer's written instructions.
 - b. The joining method shall be butt fusion method and shall be performed in accordance with the pipe manufacturer's recommendations. Butt fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe

- manufacturer, including but not limited to, temperature requirements, alignment, and fusion pressures.
 - c. Personnel trained in butt fusion techniques by the manufacturer of the pipe, shall supervise or perform butt fusion operations.
 - d. Butt fusion shall be performed between pipe ends or pipe ends and fitting and valve outlets, of like outside diameter and wall thickness, SDR or DR. Butt fusion joining between same diameters but unlike wall thickness shall not be permitted. Transitions between unlike wall thickness shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means.
 - e. Branch connections to the main shall be made with polyethylene fittings, and butt fused.
 - f. Bent Strap Test: On each day that butt fusions are to be made, perform a "Bent Strap Test." The first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, and then fusion test straps shall be cut out. The test strap shall be 12" (min) or 30 times the wall thickness in length with the fusion in the center, and 1" (min) or 1.5 times the wall thickness in width. Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.
5. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
- a. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.

3.3 IDENTIFICATION

- A. According to Section 312000 "Earthwork."
- B. Wrap all buried, non-metallic, nonperforated piping with tracer wire.
- C. Use detectable warning tape over piping and at outside edges of underground structures.

3.4 PIPE SLEEVE INSTALLATION

- A. Where waterline crosses road paving install waterline in pipe sleeve. Extend pipe sleeve a minimum of three feet beyond edge of pavement.
- B. End Seals
 - 1. The annular space between the sleeve or casing and the installed pipe shall be plugged with an end seal to provide a positive seal against a hydrostatic head and prevent soil from entering the space.

3.5 HYDROSTATIC TESTING

- A. General
 - 1. The Contractor shall conduct pressure and leakage tests on all newly constructed portions of the water system, including water mains, service lines, fittings, valves, and hydrants. New waterlines that are extensions or modifications of an existing water system shall be tested at the test pressure specified here unless the Contracting Officer specifies another pressure. Pneumatic testing will not be allowed.
 - 2. The contractor shall ensure that any appurtenance attached to the pipeline at the time of testing is rated to withstand the pressures that will exist during testing.
 - 3. Conduct piping tests before joints are covered and after thrust blocks, if required, have hardened sufficiently. Joints shall remain uncovered until testing is completed satisfactorily.
 - 4. The Contractor shall furnish the pump, pipe, gauge, measuring device, connections, and all other necessary equipment, and shall furnish the necessary personnel to conduct the tests. All equipment, gauges, and attachments shall be subject to approval by the Contracting Officer.
 - 5. The Contracting Officer shall be present during the testing period.

6. Waterlines shall be tested in sections not to exceed 2,000 ft in length or a maximum pressure differential of 30 psi in the test section.
7. No paints, asphalts, tars, enamels, or other types of pipe compounds shall be used to eliminate leaks.

B. Pressure and Leakage Test

1. The test pressure shall:
 - a. Equal at least 125 psi at the highest elevation of the test but not exceed 160 psi at any point being tested.
 - b. Not exceed the thrust restraint design pressures.
 - c. Not vary by more than ± 5 psi from the established test pressure.
 - d. Not exceed twice the rated pressure of valves when the test section includes closed valves.
 - e. Be not less than 100 psi for all piping within buildings.
2. Pressure Test Procedure
 - a. Equipment: The test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Contracting Officer.
 - b. Preparation: Fill pipeline 24 hours before testing. Use only potable water. Each valved section of pipeline shall be slowly filled with water and all air shall be expelled from the pipeline. Apply test pressure to stabilize system.
 - c. Pressurization:
 - 1) Increase pressure in 50-psig increments and inspect each joint between increments.
 - 2) Hold at test pressure for 1 hour.
 - 3) Decrease to 0 psig.
 - 4) Slowly increase again to test pressure and hold for 1 more hour. If the test pressure cannot be sustained within ± 5 psi during this time, then the system will be determined to have leakage.
 - 5) Leakage shall be verified by the Contractor and the Contracting Officer.
 - 6) Locate and repair leaking joints with new materials and repeat test until leakage is within allowed limits. All visible leaks are to be repaired regardless of the amount of leakage.
 - d. Examination: All exposed pipe, fittings, valves, and joints shall be carefully examined. Any cracked or defective pipe, fitting, or valve discovered shall be repaired or replaced by the Contractor at his own expense with new material and the test repeated until satisfactory to the Contracting Officer.
3. Results
 - a. The Contractor shall furnish a written report to the Contracting Officer describing the results of each test. The report must identify the specific portions of the pipeline tested, the pressure, the duration of the tests, and the amount of leakage.

3.6 CLEANING AND DISINFECTION

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:
 - a. Flushing Pipelines
 - 1) After the pressure and leakage testing has been completed, all water pipes shall be thoroughly flushed.

- 2) Flushing shall remove all debris from the pipeline, including HDPE pipe shavings, gravel and any other material that may have accidentally entered the pipeline during construction.
- 3) Remove all self-closing faucets and drinking fountains from hydrants before flushing lines. Failure to do so will likely clog the internal parts of the faucet.
- 4) If no hydrants or other outlets are installed at the end of the waterline, an outlet at the end of each lateral shall be provided. Outlets shall be large enough to develop a velocity in the waterlines of at least 2.5 feet per second (see Table 1 for necessary flows). If necessary, use a booster pump or other method to obtain the necessary flows.
- 5) Minimum velocities must be obtained in all mainlines, laterals and drainlines.
- 6) Ensure flushing outlets have adequate drainage and no damage or erosion will occur from the flushing process. Install hoses and/or pipe extensions if necessary.

TABLE 1
Required Flow in Gallons per Minute
(GPM) to provide 2.5 feet per second
Flushing Velocity

Type of Pipe			
Nominal Pipe Size (inches)	HDPE (SDR 11)	PVC (160 psi)	Galv. Steel (Schedule 40)
1	7	9	7
1 ¼	11	15	12
1 ½	14	19	16
2	22	30	27
2 ½	-	44	38
3	49	64	58
3 ½	-	84	77
4	81	106	100
5	-	162	156
6	175	229	225
8	274	388	390
10	461	603	615
12	648	848	872

b. Requirement of Chlorination

- 1) Pipelines: After flushing, all new waterlines and repaired portions of, or extensions to, existing waterlines shall be disinfected by chlorination. Chlorination shall provide a minimum of 25 mg/l residual after 24 hours contact in the system. This may be expected with an application of 50 mg/l, although some conditions may require more. The entire system including the storage tank or spring box shall be filled with the disinfecting solution. All taps, hydrants, and other outlets shall be opened and left open until chlorine is noticeable by odor or testing in the water coming from each. Immediately close taps, hydrants, and other outlets. The chlorinated water shall be retained in the waterlines for at least 24 hours. An alternative of introducing a chlorine solution of 300 mg/l for a period of 3 hours is also approved.
- 2) Reservoirs Only: For large reservoirs where water is not going to be reused to disinfect connecting distribution lines, or where it is not economical to treat the entire contents with 50 mg/l of chlorine, disinfection can be accomplished by swabbing or spraying the walls, floor, and ceiling with a chlorine solution containing 300 mg/l of available chlorine. A minimum of 3 hours shall elapse before the structure is flushed and returned to service.

c. Preparation of Disinfecting Mixture: Chlorine-bearing compounds used for disinfection shall comply with ANSI/NSF 60.

- 1) Calcium hypochlorite must be prepared as a water mixture for introduction into the waterlines. The powder should first be made into a paste and then thinned to either a 1 percent or 5.25 percent chlorine solution.
- 2) Sodium hypochlorite is already a water mixture.
- 3) Table 2 gives the amount of chlorine-bearing compound to mix to obtain either a 1 percent or 5.25 percent solution.
- 4) Table 3 gives the amount of a 1 percent or 5.25 percent solution required to obtain a 50 mg/l solution for various volumes.
- 5) Table 4 gives the volume of water contained in each 100 feet of pipe of various sizes.

TABLE 2

Amount of Chlorine-bearing Compound to Mix to Obtain a 1% or 5.25% Solution				
Product	1% Solution		5.25% Solution	
	Amount of Compound	Gallons of Water	Amount of Compound	Gallons of Water
Calcium Hypochlorite (65% Cl)	1 pound	7.67	1 pound	1.36
Sodium Hypochlorite (5.25% Cl)	1 gallon	4.25	1 gallon	0

TABLE 3

Amount of Chlorine-Water Solution Required to make 50 mg/l Chlorine Solution for Various Volumes		
Volume (Gallons)	5.25% Solution	1.00% Solution
100	1.52 cup	0.50 gal.
500	0.48 gal.	2.50 gal.
1,000	0.95 gal.	5.00 gal.
5,000	4.76 gal.	25.0 gal.
10,000	9.52 gal.	50.0 gal.
50,000	47.6 gal.	250 gal.
100,000	95.2 gal.	500 gal.

TABLE 4

Volume in Gallons per 100 feet of Pipe			
Nominal Pipe Size (inches)	Type of Pipe		
	HDPE (SDR 11)	PVC (160 psi)	Galv. Steel (Schedule 40)
1	4.6	5.8	4.5
1 1/4	7.3	9.6	7.8
1 1/2	9.6	12.6	10.6
2	15.0	19.6	17.4
2 1/2	-	28.8	24.9
3	32.6	42.6	38.4
3 1/2	-	55.6	51.4
4	53.8	70.4	66.1
5	-	107.5	103.9
6	116.7	152.6	150.1
8	182.8	258.6	259.9
10	307.2	401.8	409.6
12	432.2	565.2	581.4

- d. Method of Chlorine Application: The preferred method is to fill the storage tank (for a distribution system) or the spring head box (for a supply system) with chlorinated water of the proper strength. The water shall then be released through the outlet lines to the remainder of the system and retained there for the required period of time. If either of these points of

application is unavailable, chlorinated water of the proper strength may be added to the beginning of the pipeline extension, or to any valved section of the extension, through a corporation stop installed by the Contractor in the top of the pipe. Other methods may be approved by the Contracting Officer.

- e. Testing of Chlorine Residual: To ascertain the concentration, the chlorine residual shall be measured by the Contracting Officer in accordance with the procedures described in the current edition of "Standard Methods for the Examination of Water and Wastewater," or AWWA M12, or by using an appropriate high-range chlorine test kit
- f. Final Flushing and Testing: Following the retention period, as specified in this Section, all heavily chlorinated water shall be thoroughly flushed from the pipeline until the chlorine concentration in the water leaving any part of the line is no higher than 1 mg/l.
- g. Disposal:
 - 1) Heavily chlorinated water shall not be drained directly into streams, rivers, lakes or drainage ditches which lead to surface water.
 - 2) When emptying the lines or tank after the 24-hour period, whether the system has passed or failed, the chlorine solution shall be neutralized before being discharged. Neutralize system by adding sodium thiosulfate to the storage tank in accordance with Table 5 below. Let the sodium thiosulfate sit in the storage tank for 24-hours and then release the water from the tank and flush the system. Residual chlorine at the outlets shall be minimal.

TABLE 5
Amounts of Chemical Required to Neutralize
Various Residual Chlorine Concentrations in
1,000 gallons of Water

Residual Chlorine Concentration mg/L	Pounds of Sodium Thiosulfate ($\text{Na}_2 \text{S}_2 \text{O}_3 - 5\text{H}_2\text{O}$)
1	0.012
2	0.024
10	0.12
50	0.60

- h. Bacteriological Examination: After the system has been disinfected as specified, but before the new water piping is put to use or connected to existing piping, the Contractor shall test the water for bacteriological contamination from representative points in the system as approved by the Contracting Officer. The coliform organisms shall be tested for presence/absence in accordance with State drinking water regulations. If coliform bacteria are present, testing shall be repeated in accordance with State drinking water regulations. If the report of this examination is unsatisfactory, the system shall be flushed and the disinfection procedure repeated until the results of bacteriological examinations are satisfactory.

END OF SECTION 221100
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 221102 - CURB VALVES AND BOXES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Curb Valves and Boxes.
- B. Related Sections include the following:
 - 1. Section 312000 "Earthwork."

1.2 QUALITY ASSURANCE

- A. All work is to be completed according to applicable Federal, State and Local codes.

1.3 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CURB VALVES AND BOXES

- A. Valves: Valves shall be the same nominal size as the line in which they are installed or as indicated on the Drawings.
 - 1. Valve Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and end matching curb valve. Furnish one valve operating wrench or shut-off rod with every five (or fraction thereof) curb boxes installed, as indicated on the Drawings.
 - a. Stationary Rods for Metal Valves: Steel, with adapter to fit valve, extend to within 12 inches of ground level.
 - 2. Metal Valves
 - a. 3/4-Inch Through 2-Inch Valves:
 - 1) Design: Minneapolis Top, Solid Tee Head, AWWA C 800.
 - 2) Model: "Mark II Oriseal" Valve, Mueller H-10287, as manufactured by Mueller Company, or an approved equal.
 - b. Valves Larger than 2-Inches:
 - 1) Design: AWWA C 509, NSF 61, gate valves with iron body, "O" ring stem seals, nonrising stem, with 2-inch square wrench nut head.
 - 2) Ends: Threaded, flanged, hub, spigot, mechanical joint or other as appropriate for connection to line in which they are installed.
 - 3) Model: Mueller A-2360, as manufactured by Mueller Company, or an approved equal.
- B. Curb Boxes:
 - 1. Lids: Lockable, with pentagon-type bolt, compatible with valve box; labeled "WATER" or "SEWER" respectively.
 - 2. Pentagon Lid Keys: Furnish one key with every five (or fraction thereof) curb boxes installed.
 - 3. Curb Boxes for Metal Valves:

- a. For 3/4-Inch Through 2-Inch Valves: Extension type, Minneapolis pattern base. Models below as manufactured by Mueller Company or an approved equal.
 - 1) 3/4-Inch and 1-Inch Valves: Mueller H-10302.
 - 2) 1-1/4-Inch Through 2-Inch Valves: Mueller H-10304.
 - 3) Outside roadways, a galvanized pipe and threaded cap may be used in lieu of a commercial curb box, as indicated on the Drawings.
 - b. For Valves Larger Than 2-Inches: Buffalo type, two piece, 5-1/4-Inch, Series 6855 as manufactured by Tyler Corporation, or an approved equal.
4. Curb Boxes for Poly Valves:
- a. Design: Slider or screw type, Buffalo pattern.
 - b. Bottom Sections: Compatible with valve.
 - c. For 1-Inch Valves: 2-1/2-Inch shaft, Series 200 or 250 Plastic Boxes, with #002 bottom sections, as manufactured by Bingham and Taylor or an approved equal.
 - d. For 2-Inch Through 6-Inch Valves: 5-1/4-Inch shaft, Series 500 Plastic Boxes, as manufactured by Bingham and Taylor or an approved equal.
 - 1) Bottom Sections for 2" or 3" Valves: #104
 - 2) Bottom Sections for 4" Valves: #105
 - 3) Bottom Sections for 6" Valves: #108
- C. Gravel: Hard, durable, screened material, 1/4-inch to 1-inch in size, free of soil or clay lumps.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating and backfilling for valves and boxes is specified in Section 312000 "Earthwork."

3.2 CURB VALVE AND BOX INSTALLATION

- A. Crushed Gravel Bed: Under each valve, 12-inch minimum diameter, 12-inch minimum depth.
- B. Curb Box Position: Centered over valve bonnet, no part in contact with valve.
- C. Curb Box Lid: Flush with finished grade, unless indicated otherwise on the Drawings.

END OF SECTION 221102
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY, Section Includes:

1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
2. Encasement for piping.

1.3 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.4 SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.
- B. System purging and disinfecting activities report.
- C. Field quality-control reports.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 1. Notify COR no fewer than two days in advance of proposed interruption of water service.
 2. Do not interrupt water service without COR's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- G. Copper Pressure-Seal-Joint Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Elkhart Products Corporation](#).
 - b. [NIBCO Inc.](#)
 - c. [Viega](#).
 - 2. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 3. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
- H. Copper-Tube, Extruded-Tee Connections:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. [T-Drill Industries Inc.](#)
 - 2. Description: Tee formed in copper tube according to ASTM F 2014.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.

3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Piping Specialties Products.
 - c. Ford Meter Box Company, Inc. (The).
 - d. JCM Industries.
 - e. Romac Industries, Inc.
 - f. Smith-Blair, Inc.; a Sensus company.
 - g. Viking Johnson.
 - h. <Insert manufacturer's name>.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hart Industries International, Inc.
 - b. Jomar International.
 - c. Matco-Norca.
 - d. McDonald, A. Y. Mfg. Co.
 - e. Watts; a division of Watts Water Technologies, Inc.
 - f. Wilkins; a Zurn company.
 2. Standard: ASSE 1079.
 3. Pressure Rating: 125 psig minimum at 180 deg F.
 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Matco-Norca.
 - b. Watts; a division of Watts Water Technologies, Inc.
 - c. Wilkins; a Zurn company.
 2. Standard: ASSE 1079.
 3. Factory-fabricated, bolted, companion-flange assembly.
 4. Pressure Rating: 125 psig minimum at 180 deg F.
 5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
- D. Dielectric-Flange Insulating Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Central Plastics Company.
 - d. Pipeline Seal and Insulator, Inc.
 2. Nonconducting materials for field assembly of companion flanges.

3. Pressure Rating: 150 psig.
4. Gasket: Neoprene or phenolic.
5. Bolt Sleeves: Phenolic or polyethylene.
6. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Elster Perfection Corporation.](#)
 - b. [Grinnell Mechanical Products; Tyco Fire Products LP.](#)
 - c. [Matco-Norca.](#)
 - d. [Precision Plumbing Products, Inc.](#)
 - e. [Victaulic Company.](#)
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Division 31 Sections for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- G. Install domestic water piping level without pitch and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

- J. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- L. Install piping to permit valve servicing.
- M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- N. Install piping free of sags and bends.
- O. Install fittings for changes in direction and branch connections.
- P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- Q. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- R. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

- G. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2104. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- I. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition unions.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.

5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
 2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

- d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:
 - 1. HDPE.
- E. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L wrought-copper, solder-joint fittings; and brazed joints.
 - 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
 - 3. Hard copper tube, ASTM B 88, Type L; wrought copper extruded-tee connectins, brazed joints.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller.
 - 2. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Temperature-actuated, water mixing valves.
5. Strainers.
6. Wall hydrants.
7. Drain valves.
8. Water-hammer arresters.
9. Trap-seal primer valves.

B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.
3. Section 224716 "Pressure Water Coolers" for water filters for water coolers.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Field quality-control reports.
- C. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 and NSF 14. Mark "NSF-pw" on plastic piping components.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Chrome plated.

- B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Chrome or nickel plated.

2.4 BACKFLOW PREVENTERS

- A. Double-Check, Backflow-Prevention Assemblies:

1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.
3. Pressure Loss: 5 psig maximum, through middle third of flow range.
4. Size: See drawings.
5. Design Flow Rate: Consult with COR.
6. Body: Bronze for NPS 2 and smaller; steel with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
8. Configuration: Designed for horizontal, straight-through flow.
9. Accessories:
 - a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
 - b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

2.5 WATER PRESSURE-REDUCING VALVES

- A. Water Regulators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Conbraco Industries, Inc.](#)
 - b. [Honeywell International Inc.](#)
 - c. [Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.](#)
 - d. [Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.](#)
2. Standard: ASSE 1003.
3. Pressure Rating: Initial working pressure of 150 psig.

4. Size: See drawings.
5. Design Flow Rate: See drawings.
6. Design Inlet Pressure: See drawings.
7. Design Outlet Pressure Setting: See drawings.
8. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
9. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.6 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Armstrong International, Inc.](#)
 - b. [Leonard Valve Company.](#)
 - c. [Symmons Industries, Inc.](#)
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded union inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: To be determined after construction. Consult COR.
9. Tempered-Water Design Flow Rate: To be determined after construction. Consult COR
10. Selected Valve Flow Rate at 45-psig Pressure Drop: See drawings.
11. Valve Finish: Rough bronze.
12. Piping Finish: Copper.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.020 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.8 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed or exposed-outlet, self-draining wall hydrants.

2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Nozzle and Wall-Plate Finish: Rough bronze.
9. Operating Keys(s): Two with each wall hydrant.

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.10 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [AMTROL, Inc.](#)
 - b. [Josam Company.](#)
 - c. [MIFAB, Inc.](#)
 - d. [Precision Plumbing Products, Inc.](#)
 - e. [Sioux Chief Manufacturing Company, Inc.](#)
 - f. [Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.](#)
 - g. [Tyler Pipe; Wade Div.](#)
 - h. [Watts Drainage Products.](#)
 - i. [Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.](#)
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.11 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [MIFAB, Inc.](#)
 - b. [Precision Plumbing Products, Inc.](#)
 - c. [Sioux Chief Manufacturing Company, Inc.](#)
 - d. [Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.](#)
 - e. [Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.](#)
- 2. Standard: ASSE 1018.
 - 3. Pressure Rating: 125 psig minimum.
 - 4. Body: Bronze.
 - 5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
 - 6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
 - 7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
- D. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve and pump.
- E. Install water-hammer arresters in water piping according to PDI-WH 201.
- F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Division 26 Sections.
- B. Fire-retardant-treated-wood blocking is specified in Division 26 Sections.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Test each double-check, backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.
- B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 221300 - ONSITE WASTEWATER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Pipe and fittings, including cleanouts. Includes trench.
- B. Related Sections include the following:
 - 1. Section 024100 "Waste Material Disposal."
 - 2. Section 221100 "Water Distribution System."
 - 3. Section 312000 "Earthwork."

1.2 DEFINITIONS

- A. NPWL: Non-potable waterline (includes sewerline).

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. Pipe and fittings, including cleanouts.
- B. Shop Drawings: Include access way openings, covers, pipe connections, and accessories for the following precast concrete structures:

1.4 QUALITY ASSURANCE

- A. All work is to be completed according to applicable Federal, State and Local codes.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Sewer Service: Do not interrupt service to facilities occupied by the Government or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Contracting Officer no fewer than two days in advance of proposed interruption of service.
 - 2. Do not proceed with interruption of service without written permission from Contracting Officer.

1.6 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: 10-foot head of water.

1.7 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 DISTRIBUTION PIPES AND FITTINGS

- A. Sewer Pipe and Fittings: Gravity, non-pressurized.
 - 1. PVC: ASTM D 3034, SDR 35, nonperforated, for solvent-cement or elastomeric gasket joints.
 - a. Solvent Cement: ASTM D 2564.
 - b. Gaskets: ASTM F 477, elastomeric seal.

2.2 NONPRESSURE-TYPE PIPE COUPLINGS

- A. Description: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - 1. Sleeve Materials:
 - a. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - b. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

2.3 CLEANOUTS

- A. PVC Cleanouts: PVC pipe fitting for solvent-cement or elastomeric gasket joint with Brass threaded cleanout plug. Install in below grade box as shown on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements and other conditions affecting performance of septic tank systems.
- B. Verify compatibility with and suitability of soil structure and materials.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Refer to Section 312000 "Earthwork" for excavating, trenching, bedding, and backfilling.
 - 1. Stockpile topsoil for reuse in finish grading without intermixing with other excavated material. Stockpile materials away from edge of excavation and do not store within drip line of remaining trees.
 - 2. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3.3 PIPING INSTALLATION

- A. Construct the sewer system to the lines and grades shown or established in the field.
- B. Stake locations of sewerlines as shown on the Drawings. Sewerline location shall be approved by the Contracting Officer before installation.
- C. All sewerline shall be graded to drain.
- D. All pipe, fittings, and appurtenances shall be handled and installed in strict conformance to the manufacturer's recommendations.
- E. The interior of all pipe, fittings, and other accessories shall be kept as free as possible from dirt and foreign matter at all times. Each piece of line as it is laid shall be cleaned of all debris. When the pipeline has become dirty on the inside during shipment or storage, it shall be swabbed out by drawing a damp swab through the line before placing in trench. Care shall be exercised to keep all joining surfaces clean. Any pipe with contaminated or damaged joining surfaces, which cannot be satisfactorily cleaned or repaired, shall be discarded. Under no circumstances shall pipe be installed in water, and no pipe shall be installed when trench conditions or the weather is unsuitable for such work. At all times when work is not in progress, all open ends of the pipe and fittings shall be securely closed to the satisfaction of the Contracting Officer so that no trench water, rodents, earth, or other substance will enter the pipe or fittings.
- F. Any section of pipe already installed and found to be defective shall be removed and replaced with new pipe at the Contractor's expense.
- G. Water and Non-Potable/Sewer Line Crossings

1. Potable and NPWL lines shall never be installed in the same trench.
 2. If a new line crosses below an existing line, the existing line shall be supported to prevent settling.
 3. Where waterlines intersect NPWLs or are within 10 horizontal feet of NPWLs, the following applies:
 - a. At least one of the pipes (either the waterline or NPWL) shall be constructed or reconstructed with 200 psi pipe or encased in a continuous sleeve with same rating. At crossing, extend 200 psi pipe or sleeve for a distance of 10 feet perpendicular distance from each side of the waterline. The waterline and NPWL pipes or sleeves shall be centered at the crossing so that the joints will be an equal distance and as far as possible from the crossing.
 - 1) Sleeves: Nominal sleeve diameter to be at least 3 inches larger than nominal diameter of pipe to be encased. Install end seals in annular space at each end of sleeves.
 - 2) In lieu of constructing or reconstructing the NPWL with pipe conforming to waterline requirements, the NPWL may be encased in concrete at least 6 inches thick around the pipe measured at the bell, for 10 feet each side of the waterline.
 - b. Construct according to applicable federal, state and local regulations,. The Contractor is responsible for obtaining and following these regulations.
 - c. Where applicable, state and local regulations supersede the above requirements.
- H. A minimum of one-foot separation shall be maintained between electric and sewerlines in the same trench. Unless the electric conductors are in conduit the sewerline shall be a minimum of one foot below the electric conductors.
- I. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration.
- J. Cutting and Handling of Pipe
1. Cutting of pipe for closure pieces or for other reasons shall be done in a neat manner by methods, which will not damage the pipe. The pipe and fittings shall be handled in such a manner as to insure delivery and final placement in good, undamaged condition. Particular care shall be exercised not to injure the pipe surfaces or coatings. Damaged pipe shall not be used in the work.
- K. Laying Pipe
1. No pipe shall be placed in the trench until the Contracting Officer has approved the trench and bedding.
 2. Pipes shall be placed true to the lines and grades shown on the Drawings and as specified. Sewerlines shall be constructed to drain at a minimum grade of 2%. Sewerlines not meeting this requirement shall be removed by the Contractor and replaced at no cost to the Government.
 3. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel.
 4. Backfill the pipe within 24 hours after installing the pipe in the trench, leaving the joints and one foot of pipe on each side of each joint exposed until testing is complete.
 5. When work is not in progress, securely close open ends of pipe and fittings.
 6. When high density polyethylene or solvent weld joint pipe is used, it shall be weaved in the trench to provide horizontal slack in the line for expansion and contraction.
 7. When pipes are installed in a structure or utility box, they shall be adequately supported.
 8. Use proper fittings in order to follow the required line and grades and to avoid excessive curvature. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed the manufacturer's recommended maximum joint deflection or curvature for their pipe.
 9. When more than one pipeline is in the same trench, the pipes shall be separated by at least eight horizontal inches, or as shown on the Drawings.
 10. Bends that result in joint tension or permanent pipe deformation are prohibited.
 11. Pipelines may be relocated slightly, if necessary, to avoid existing obstacles. However, the required slopes must be maintained.
- L. Branch Connections

1. Branch connections to the main shall be made with wyes or sanitary tees.

M. Pipe Joints

1. Joints shall be made, using jointing materials and applied with the proper accessories, in accordance with the manufacturer's instructions. Completed joints shall be watertight, and capable of passing the required hydrostatic testing. If pipe and fittings are assembled with a lubricant, it must be nontoxic.
2. Dissimilar Joints: Connections between two dissimilar pipes or fittings shall be installed in manner recommended by the pipe manufacturer and approved by the Contracting Officer. Use adapters compatible with both piping materials, outer diameters and system working pressure.
 - a. For Non-Pressure Applications: Join dissimilar pipe materials according to ASTM D 5926, with couplings and gaskets compatible with pipe materials being joined.
3. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - a. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - b. PVC Nonpressure Piping: Join according to ASTM D 2855.

3.4 IDENTIFICATION

- A. According to Section 312000 "Earthwork."
- B. Wrap all buried, non-metallic, nonperforated piping with tracer wire.
- C. Use detectable warning tape over piping (including absorption-field piping), at outside edges of underground structures, and at outside edges of absorption fields.

3.5 CLEANOUT APPLICATIONS

- A. Use cleanouts according to the following:
 1. Within 10 ft of the building: PVC cleanouts.

3.6 CLEANOUT INSTALLATION

- A. PVC Cleanouts: Install with PVC riser from distribution and leaching piping to PVC cleanout at grade. Use NPS 4 PVC sewer pipe and fittings with solvent-cemented joints for risers and cleanout fitting. Install threaded cap in below grade box as shown on the Drawings.
- B. Set top of cleanout box 2 inches above surrounding rough grade, or set flush with grade if installed in pavement or gravel roadways.

3.7 SEEDING

- A. Seed in accordance with Section 329206 "Seeding."

3.8 HYDROSTATIC TESTING FOR NON-PRESSURIZED (GRAVITY) SEWERLINE

- A. Sewerline: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
 1. Plastic Sewerlines
 - a. Gravity Sewer Test: Perform test using one of the following methods.
 - 1) Gravity sewer tests shall consist of plugging the end of each sewerline section at the point of termination (manhole, septic tank, distribution box, drainfield, etc.), filling the sewerline with water, testing with at least 10-foot head of water, and maintaining such pressure for at least 1 hour. Recommended method is to install a 10-foot tall,

vertical section of sewer pipe at the highest point of the sewerline section to be tested (at building cleanout, trailer sewer service connection, septic tank outlet, etc) and fill to the point of overflow.

- 2) Perform pressure test with water-filled piping according to the International Plumbing Code (latest edition) Section 312. All portions of the system shall be tested to a pressure of at least 10-foot head of water.

B. Leaks and loss in test pressure constitute defects that must be repaired.

C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.9 FIELD QUALITY CONTROL

A. Flushing Pipelines

1. After the pressure and leakage testing has been completed, all water pipes (including perforated piping) shall be thoroughly flushed.
2. Flushing shall remove all debris from the pipeline, including HDPE pipe shavings, gravel and any other material that may have accidentally entered the pipeline during construction.
3. If no outlets are installed at the end of the waterline, an outlet at the end of each lateral shall be provided. Outlets shall be large enough to develop a velocity in the waterlines of at least 2.5 feet per second (see Table I for necessary flows). If necessary, use a booster pump or other method to obtain the necessary flows.
4. Minimum velocities must be obtained in all mainlines, laterals and drainlines.
5. Ensure flushing outlets have adequate drainage and no damage or erosion will occur from the flushing process. Precautions should be taken to ensure flushing does not damage any portion of the drainfield. Install hoses and/or pipe extensions if necessary.

B. Leakage Tests: Fill underground structures with water and let stand overnight. If water level recedes, locate and repair leaks and retest. Repeat tests and repairs until no leaks exist.

3.10 CLEANUP

A. Clean up the area by removing the unused and waste materials. Disposal of waste materials shall be in accordance with Section 024100 "Waste Material Disposal."

END OF SECTION 221300

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Pipe, tube, and fittings.
2. Specialty pipe fittings.

B. Related Section:

1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- E. Adhesive Primer: ASTM F 656.
- F. Solvent Cement: ASTM D 2564.

2.3 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 3. Shielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cascade Waterworks Mfg. Co.
 - 2) Mission Rubber Company; a division of MCP Industries, Inc.
 - b. Standard: ASTM C 1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- K. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- L. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- M. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

- N. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- P. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."
- Q. Install aboveground PVC piping according to ASTM D 2665.
- R. Install underground PVC piping according to ASTM D 2321.

3.3 JOINT CONSTRUCTION

- A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- C. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 6. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.

- b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
- 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for ABS piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- I. Install supports for vertical ABS piping every 48 inches.
- J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

5. Comply with requirements for cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
6. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.

- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed ABS Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless, cast-iron soil pipe and fittings; CISPI or hubless-piping couplings; and coupled joints.
 - 2. Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless, cast-iron soil pipe and fittings; CISPI or hubless-piping couplings; and coupled joints.
 - 2. Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless, cast-iron soil pipe and fittings; CISPI or cast-iron hubless-piping couplings; and coupled joints.
 - 2. Cellular-core ABS pipe, ABS socket fittings, and solvent-cemented joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

- 1.1 SUMMARY, Section Includes:
1. Cleanouts.
 2. Floor drains.
 3. Roof flashing assemblies.
 4. Miscellaneous sanitary drainage piping specialties.
 5. Flashing materials.
- 1.2 MEASUREMENT & PAYMENT
- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.
- 1.3 SUBMITTALS
- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.
- 1.4 QUALITY ASSURANCE
- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

- 2.1 CLEANOUTS
- A. Exposed Cast-Iron Cleanouts:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Josam Company.](#)
 - b. [Smith, Jay R. Mfg. Co.](#)
 - c. [Tyler Pipe.](#)
 - d. [Watts Drainage Products.](#)
 - e. [Zurn Plumbing Products Group.](#)
 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
 3. Size: Same as connected drainage piping
 4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 5. Closure: Countersunk or raised-head, brass plug.
 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Josam Company; Josam Div.](#)
 - b. [Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.](#)
 - c. [Tyler Pipe; Wade Div.](#)
 - d. [Watts Drainage Products Inc.](#)
 - e. [Zurn Plumbing Products Group; Light Commercial Operation.](#)
 - f. [Zurn Plumbing Products Group; Specification Drainage Operation.](#)
2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: No hub.
8. Closure: Brass plug with straight threads and gasket.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Polished bronze.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Josam Company; Josam Div.](#)
 - b. [Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.](#)
 - c. [Tyler Pipe; Wade Div.](#)
 - d. [Watts Drainage Products Inc.](#)
 - e. [Zurn Plumbing Products Group; Specification Drainage Operation.](#)
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Josam Company; Josam Div.](#)
 - b. [Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.](#)
 - c. [Tyler Pipe; Wade Div.](#)
 - d. [Watts Drainage Products Inc.](#)
 - e. [Zurn Plumbing Products Group; Light Commercial Operation.](#)
 - f. [Zurn Plumbing Products Group; Specification Drainage Operation.](#)
2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.

4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Not required.
7. Clamping Device: Not required.
8. Outlet: Bottom.
9. Coating on Interior and Exposed Exterior Surfaces: Not required.
10. Sediment Bucket: Not required.
11. Top or Strainer Material: Bronze.
12. Top of Body and Strainer Finish: Polished bronze or Rough bronze.
13. Top Shape: Square.
14. Top Loading Classification: Medium Duty.
15. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection. Coordinate with drawings.
16. Trap Material: Match piping material.
17. Trap Pattern: Standard P-trap.
18. Trap Features: Trap-seal primer valve drain connection.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Roof Flashing Materials: Unless noted elsewhere, provide roof flashing as required/recommended by roofing and/or piping manufacturer.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

B. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

C. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 2 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

D. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.

2. Size: Same as connected stack vent or vent stack.

E. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.

- H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- I. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- J. Install vent caps on each vent pipe passing through roof.
- K. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

- A. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- B. Set flashing on floors and roofs in solid coating of bituminous cement.
- C. Secure flashing into sleeve and specialty clamping ring or device.
- D. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 sections.
- E. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

- 1.1 SUMMARY, Section Includes:
 - 1. Residential, power-vent, gas-fired, storage, domestic-water heaters.
 - 2. Domestic-water heater accessories.
- 1.2 MEASUREMENT & PAYMENT
 - A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.
- 1.3 PERFORMANCE REQUIREMENTS
 - A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
- 1.4 ACTION SUBMITTALS
 - A. Product Data: For each type and size of domestic-water heater indicated.
- 1.5 INFORMATIONAL SUBMITTALS
 - A. Seismic Qualification Certificates: For fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.
 - B. Product certificates.
 - C. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.
- 1.6 CLOSEOUT SUBMITTALS
 - A. Operation and maintenance data.
- 1.7 QUALITY ASSURANCE
 - A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.
- C. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, ANSI 372, "Drinking Water System Components - Health Effects."

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Periods: From date of Substantial Completion.
 - a. Residential, Gas-Fired, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Five years.
 - 2) Controls and Other Components: Two years.
 - b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 RESIDENTIAL, GAS-FIRED, STORAGE, DOMESTIC-WATER HEATERS

- A. Residential, Power-Vent, Gas-Fired, Storage, Domestic-Water Heaters:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A. O. Smith Corporation.
 - b. American Water Heaters.
 - c. Bradford White Corporation.
 - d. Lochinvar, LLC.
 - e. Rheem Manufacturing Company.
 - 2. Standard: ANSI Z21.10.1/CSA 4.1.
 - 3. Storage-Tank Construction: Steel.
 - a. Tappings: ASME B1.20.1 pipe thread.
 - b. Pressure Rating: 150 psig.
 - c. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
 - 4. Factory-Installed Storage-Tank Appurtenances:
 - a. Anode Rod: Replaceable magnesium.
 - b. Dip Tube: Required unless cold-water inlet is near bottom of tank.
 - c. Drain Valve: ASSE 1005.
 - d. Insulation: Comply with ASHRAE/IESNA 90.1.
 - e. Jacket: Steel with enameled finish.
 - f. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
 - g. Burner: For use with power-vent, gas-fired, domestic-water heaters and LP-gas fuel.

- h. Automatic Ignition: ANSI Z21.20/CSA C22.2 No. 199, electric, automatic, gas-ignition system.
 - i. Temperature Control: Adjustable thermostat.
 - j. Combination Temperature-and-Pressure Relief Valve: ANSI Z21.22/CSA 4.4-M. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.
5. Power-Vent System: Exhaust fan, interlocked with burner.
- B. Capacity and Characteristics: See drawings.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A. O. Smith Corporation.
 - b. AMTROL, Inc.
 - c. Flexcon Industries.
 - d. Honeywell.
 - e. TACO Comfort Solutions, Inc.
2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
4. Capacity and Characteristics:
 - a. Working-Pressure Rating: 100 psig.
 - b. Capacity Acceptable: 2 gal. minimum.
 - c. Air Precharge Pressure: Factory Standard.

- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- C. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- D. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.
- E. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 1/2-psig pressure rating as required to match gas supply.
- F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.

2.3 SOURCE QUALITY CONTROL

- A. Domestic-water heaters will be considered defective if they do not pass tests and inspections.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Residential, Domestic-Water Heater Mounting: Install residential domestic-water heaters on floor.
 1. Maintain manufacturer's recommended clearances.
 2. Arrange units so controls and devices that require servicing are accessible.
 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
 5. Anchor domestic-water heaters to substrate.
- B. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping".
- C. Install gas-fired, domestic-water heaters according to NFPA 54.
 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
 3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
 4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231126 "Facility Liquefied-Petroleum Gas Piping."
- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- F. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."

- G. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
- H. Fill domestic-water heaters with water.
- I. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Section 231126 "Facility Liquefied-Petroleum Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Domestic-water heaters will be considered defective if they do not pass tests and inspections.

END OF SECTION 223400
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Faucets.
2. Showers.
3. Kitchen sinks.
4. Disposers.
5. Supply fittings.
6. Waste fittings.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.
- C. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.
- D. Maintenance data.

PART 2 - PRODUCTS

2.1 SHOWER FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Shower Faucets: Single handle, pressure-balance, mixing valve.
 1. Single-Handle, Pressure-Balance Faucets:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) [American Standard America.](#)
 - 2) [Ferguson Enterprises, Inc.](#)
 - 3) [Gerber Plumbing Fixtures LLC.](#)
 - 4) [Kohler Co.](#)
 - 5) [Moen Incorporated.](#)
 - 6) [Powers.](#)
 - 7) [Speakman Company.](#)

- 8) [Symmons Industries, Inc.](#)
- 9) [T & S Brass and Bronze Works, Inc.](#)
- 10) [Zurn Industries, LLC; AquaSpec Commercial Faucet Products.](#)

2. Fixture:
 - a. Standard: ASME A112.18.1/CSA B125.1 and ASSE 1016.
 - b. General: Include hot- and cold-water indicators; check stops; and hand head complying with ASSE 1014 with arm, flange, hose, and bracket. Coordinate faucet inlets with supplies.
 - c. Body Material: Solid brass.
 - d. Finish: Polished chrome plate.
 - e. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
 - f. Mounting: Exposed.
 - g. Backflow-Prevention Device for Hand-Held Shower: Not required.
 - h. Operation: Compression, manual.
 - i. Antiscald Device: Integral with mixing valve.
 - j. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
3. Supply Connections: NPS 1/2.
4. Shower Head:
 - a. Type: Hand-held, slide-bar mounted Hand-held, hook mounted.
 - b. Shower Head Material: Combined, metallic and nonmetallic with chrome-plated finish.
 - c. Spray Pattern: Fixed or Adjustable.
 - d. Integral Volume Control: Not required.
 - e. Shower-Arm, Flow-Control Fitting: Not required.

2.2 KITCHEN SINKS

- A. Kitchen Sinks: Two bowl, counter mounted, stainless steel.

1. Stainless-Steel Kitchen Sinks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the
 - b. following:
 - 1) [Elkay Manufacturing Co.](#)
 - 2) [Kohler Co.](#)
2. Fixture:
 - a. Metal Thickness: 18 gauge.
 - b. Bowls:
 - 1) Dimensions: See drawings.
 - 2) Drain: 3-1/2-inch crumb cup grid outlet for disposer.
 - a) Location: Near back of bowl.
3. Faucet: See drawings.
4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
5. Waste Fittings: Comply with requirements in "Waste Fittings" Article, except include continuous waste for multibowl sinks.
 - a. Dishwasher Air-Gap Fitting: Not required.

2.3 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Sink Faucets: Solid brass kitchen sink.

1. General-Duty, Solid-Brass Faucets:

- a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) [American Standard America.](#)
- 2) [Chicago Faucets.](#)
- 3) [Delta Faucet Company.](#)
- 4) [Elkay Manufacturing Co.](#)
- 5) [Gerber Plumbing Fixtures LLC.](#)
- 6) [Kohler Co.](#)
- 7) [Moen Incorporated.](#)
- 8) [Zurn Plumbing Products Group.](#)

2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
4. Kitchen Sink Option: Separate hand spray complying with ASSE 1025.
5. Finish: Polished chrome plate.
6. Maximum Flow Rate: 2.5 gpm unless otherwise indicated.
7. Mixing Valve: Single control.
8. Backflow-Prevention Device for Hand Spray: Not required.
9. Centers: Single hole.
10. Mounting: Deck, exposed.
11. Handle(s): Lever.
12. Spout Type: Swivel gooseneck.
13. Spout Outlet: Aerator.
14. Drain: Grid.

2.4 DISPOSERS

A. Disposers: Continuous-feed household, food waste.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [American Standard America.](#)
- b. [InSinkErator.](#)
- c. [KitchenAid.](#)
- d. [Maytag.](#)

2. Standards: ASSE 1008 and UL 430, and listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. General: Include reset button; wall switch; corrosion-resistant chamber with jam-resistant, cutlery- or stainless-steel grinder or shredder; NPS 1-1/2 outlet; quick-mounting, stainless-steel sink flange; antisplash guard; and combination cover/stopper.
4. Model: Sound-insulated chamber.
5. Motor: 115 V ac, 1725 rpm, 3/4 hp with overload protection.

2.5 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Kitchen Sink Supply Fittings:
 - 1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
 - 2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
 - a. Operation: Wheel handle.
 - 3. Risers:
 - a. Size: NPS 3/8 NPS 1/2 for kitchen sinks.
 - b. Material: ASME A112.18.6, braided- or corrugated-stainless-steel flexible hose riser.

2.6 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 offset tailpiece for accessible lavatories.
- C. Drain: Grid type with NPS 1-1/2 straight tailpiece for standard kitchen sinks.
- D. Trap:
 - 1. Size: NPS 1-1/2 for kitchen sinks.
 - 2. Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow with 0.032-inch-thick brass tube to wall and chrome-plated-brass or -steel wall flange.

2.7 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install plumbing fixtures level and plumb according to roughing-in drawings.
- B. Install counter-mounting fixtures in and attached to casework.
- C. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping."
- D. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- E. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- F. Install traps on fixture outlets.
 1. Exception: Omit trap on fixtures with integral traps.
 2. Exception: Omit trap on indirect wastes unless otherwise indicated.
- G. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- H. Set shower receptors in leveling bed of cement grout.
- I. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- J. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Sections.

3.2 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.3 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.4 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by COR.

END OF SECTION 224100

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 224213.13 - COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY, Section Includes:

- 1. Water closets.
- 2. Flushometer valves.
- 3. Toilet seats.

1.3 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for water closets.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.
- C. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

PART 2 - PRODUCTS

2.1 FLOOR-MOUNTED, TANK TYPE WATER CLOSETS

- A. Water Closets: Floor mounted, bottom outlet, top spud.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [American Standard America.](#)
 - b. [Crane Plumbing, L.L.C.](#)
 - c. [Ferguson Enterprises, Inc.; ProFlo Brand.](#)
 - d. [Kohler Co.](#)

- e. [TOTO USA, INC.](#)
 - f. [Zurn Industries, LLC; Commercial Brass and Fixtures.](#)
- 2. Bowl:
 - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
 - b. Material: Vitreous china.
 - c. Style: Tank
 - d. Height: Standard or Handicapped/elderly, complying with ICC/ANSI A117.1.
 - e. Rim Contour: Elongated.
 - f. Water Consumption: See drawings.
 - g. Color: White.
 - 3. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.

2.2 TOILET SEATS

- A. Toilet Seats:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [American Standard America.](#)
 - b. [Bemis Manufacturing Company.](#)
 - c. [Church Seats.](#)
 - d. [Kohler Co.](#)
 - e. [Olsonite Seat Co.](#)
 - f. [TOTO USA, INC.](#)
 - g. [Zurn Industries, LLC; Commercial Brass and Fixtures.](#)
 - 2. Standard: IAPMO/ANSI Z124.5.
 - 3. Material: Plastic.
 - 4. Type: Commercial (Standard).
 - 5. Shape: Elongated rim, open front.
 - 6. Hinge: Check.
 - 7. Hinge Material: Noncorroding metal.
 - 8. Seat Cover: Not required.
 - 9. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Water-Closet Installation:
 - 1. Install level and plumb according to roughing-in drawings.

2. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- B. Support Installation:
 1. Use carrier supports with waste-fitting assembly and seal.
 2. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
 3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- C. Install toilet seats on water closets.
- D. Wall Flange and Escutcheon Installation:
 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
 3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- E. Joint Sealing:
 1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
 2. Match sealant color to water-closet color.
 3. Comply with sealant requirements specified in Division 07 Sections.

3.3 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 224213.16 - COMMERCIAL URINALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Urinals.
2. Flushometer valves.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves **and electronic sensors** to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WALL-HUNG URINALS

- A. Urinals: Wall hung, back outlet, siphon jet, **accessible**.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. American Standard.
- b. Gerber Plumbing Fixtures LLC.
- c. Kohler Co.
- d. Mansfield Plumbing Products LLC.
- e. Peerless Pottery Sales, Inc.
- f. Zurn Industries, LLC.

2. Fixture:

- a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
- b. Material: Vitreous china.
- c. Type: Siphon jet.

- d. Strainer or Trapway: **Manufacturer's standard strainer** with integral trap.
 - e. Water Consumption: **Water saving.**
 - f. Spud Size and Location: NPS 3/4; **top.**
 - g. Outlet Size and Location: NPS 2; back.
 - h. Color: White.
- 3. Flushometer Valve: Hard lever.
 - 4. Waste Fitting:
 - a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
 - b. Size: NPS 2.
 - 5. Support: **Type I Urinal Carrier** with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture. **Include rectangular, steel uprights.**
 - 6. Urinal Mounting Height: **See drawings.**

2.2 URINAL FLUSHOMETER VALVES

A. Lever-Handle, Diaphragm Flushometer Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Delany Products.
 - b. Gerber Plumbing Fixtures LLC.
 - c. Sloan Valve Company.
 - d. Zurn Industries, LLC.
- 2. Standard: ASSE 1037.
- 3. Minimum Pressure Rating: 125 psig.
- 4. Features: Include integral check stop and backflow-prevention device.
- 5. Material: Brass body with corrosion-resistant components.
- 6. Exposed Flushometer-Valve Finish: Chrome plated.
- 7. Style: Exposed.
- 8. Consumption: **See drawings.**
- 9. Minimum Inlet: **NPS 3/4.**
- 10. Minimum Outlet: **NPS 3/4.**

2.3 SUPPORTS

A. Type I Urinal Carrier:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jay R. Smith Mfg. Co.
 - b. Josam Company.
 - c. MIFAB, Inc.
 - d. Wade Drains.
 - e. WATTS.
 - f. Zurn Industries, LLC.
- 2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.
- B. Examine walls and floors for suitable conditions where urinals will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Urinal Installation:

- 1. Install urinals level and plumb according to roughing-in drawings.
- 2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
- 3. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

- 1. Install supports, affixed to building substrate, for wall-hung urinals.
- 2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
- 3. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

- 1. Install flushometer-valve water-supply fitting on each supply to each urinal.
- 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
- 3. Install lever-handle flushometer valves for accessible urinals with handle mounted on open side of compartment.

D. Wall Flange and Escutcheon Installation:

- 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
- 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
- 3. Comply with escutcheon requirements specified in Division 07 sections.

E. Joint Sealing:

- 1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
- 2. Match sealant color to urinal color.
- 3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to urinals, allow space for service and maintenance.

3.4 ADJUSTING

- A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed urinals and fittings.
- C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 224216.13 - COMMERCIAL LAVATORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY, Section Includes:

- 1. Lavatories.
- 2. Faucets.

1.3 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.
- C. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.
- D. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

- A. Lavatory: Vitreous china; drop in mounted.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [American Standard America.](#)
 - b. [Crane Plumbing, L.L.C.](#)

- c. [Ferguson Enterprises, Inc.; ProFlo Brand.](#)
- d. [Gerber Plumbing Fixtures LLC.](#)
- e. [Kohler Co.](#)
- f. [TOTO USA, INC.](#)
- g. [Zurn Industries, LLC; Commercial Brass and Fixtures.](#)

- 2. Fixture:
 - a. Standard: ASME A112.19.2/CSA B45.1.
 - b. Type: Drop in.
 - c. Faucet-Hole Punching: 3 hole.
 - d. Faucet-Hole Location: to serve faucet noted in plans
 - e. Color: White.
 - f. Mounting Material: Sealant and mounting kit.

2.2 SOLID-BRASS, LAVATORY FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Lavatory Faucets: Automatic-type, battery-powered, electronic-sensor-operated, mixing, solid-brass valve.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [American Standard America.](#)
 - b. [Chicago Faucets.](#)
 - c. [Gerber Plumbing Fixtures LLC.](#)
 - d. [Kohler Co.](#)
 - e. [Moen Incorporated.](#)
 - f. [Sloan Valve Company.](#)
 - g. [Zurn Industries, LLC; Commercial Brass and Fixtures.](#)
 - 2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
 - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
 - 4. Body Material: Commercial, solid brass.
 - 5. Finish: Polished chrome plate.
 - 6. Maximum Flow Rate: See drawings.
 - 7. Mounting Type: Deck, concealed.
 - 8. Spout: Rigid type.
 - 9. Spout Outlet: Aerator or Laminar flow.
 - 10. Drain: Not part of faucet.

2.3 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

- E. Operation: Wheel handle.
- F. Risers:
 - 1. ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.4 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.
- C. Trap:
 - 1. Size: NPS 1-1/2 by NPS 1-1/4.
 - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated, brass or steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.
- B. Examine counters and walls for suitable conditions where lavatories will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.
- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Division 22 Sections.
- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Sections.
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Division 22 Sections.

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 224216.16 - COMMERCIAL SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY, Section Includes:

1. Service sinks.
2. Sink faucets.
3. Laminar-flow, faucet-spout outlets.
4. Supply fittings.
5. Waste fittings.

1.3 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.4 SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.
- C. Maintenance Data: For sinks to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 SERVICE SINKS

- A. Service Sinks: Enameled, cast iron, floor mounted.
 - 1. Manufacturers: Subject to compliance with requirements, products by one of the following:
 - a. [American Standard America.](#)
 - b. [Gerber Plumbing Fixtures LLC.](#)
 - c. [Kohler Co.](#)
 - d. [Zurn Industries, LLC; Commercial Brass and Fixtures.](#)
 - 2. Fixture:
 - a. Standard: ASME A112.19.1/CSA B45.2.
 - b. Style: With front apron and raised back.
 - c. Nominal Size: 28 by 28 inches.
 - d. Color: White.
 - e. Drain: Grid with NPS 2 outlet.
 - f. Rim Guard: Coated wire.
 - 3. Faucet: See drawings.

2.2 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.
- B. Sink Faucets: Manual type, two-lever-handle mixing valve.
 - 1. Commercial, Solid-Brass Faucets.
 - a. Manufacturers: Subject to compliance with requirements, products by one of the following:
 - 1) [American Standard America.](#)
 - 2) [Bradley Corporation.](#)
 - 3) [Chicago Faucets.](#)
 - 4) [Delta Faucet Company.](#)
 - 5) [Elkay Manufacturing Co.](#)
 - 6) [Kohler Co.](#)
 - 7) [Moen Incorporated.](#)
 - 8) [Speakman Company.](#)
 - 9) [T & S Brass and Bronze Works, Inc.](#)
 - 10) [Zurn Plumbing Products Group.](#)
 - 2. Standard: ASME A112.18.1/CSA B125.1.
 - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
 - 4. Body Type: Centerset.
 - 5. Body Material: Commercial, solid brass.
 - 6. Finish: Chrome plated Polished chrome plate.
 - 7. Maximum Flow Rate: 4.0 gpm.
 - 8. Handle(s): Wrist blade, 4 inches.
 - 9. Mounting Type: Back/wall, exposed.
 - 10. Spout Type: Rigid, solid brass with wall brace.
 - 11. Vacuum Breaker: Required for hose outlet.
 - 12. Spout Outlet: Hose thread according to ASME B1.20.7.

2.3 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Wheel handle.
- F. Risers:
 - 1. NPS 1/2
 - 2. Chrome-plated, rigid-copper pipe or Chrome-plated, soft-copper flexible tube or ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.4 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.

2.5 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.
- B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.

- B. Set floor-mounted sinks in leveling bed of cement grout.
- C. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- D. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Sections.
- E. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.16
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 224716 - PRESSURE WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pressure water coolers and related components.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of pressure water cooler.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.
- C. Maintenance Data: For pressure water coolers to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Filter Cartridges: Equal to 50 percent of quantity installed for each type and size indicated, but no fewer than 2 of each.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

- A. Pressure Water Coolers Flush to wall.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Elkay Manufacturing Co.](#)
 - b. [Halsey Taylor.](#)
 - c. [Haws Corporation.](#)
 - 2. Standards:
 - a. Comply with NSF 61.

- b. Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant unless otherwise indicated.
- 3. Cabinet: All stainless steel.
- 4. Bubbler: One, with adjustable stream regulator, located on deck.
- 5. Control: Push button.
- 6. Drain: Grid with NPS 1-1/4 tailpiece.
- 7. Supply: NPS 3/8 with shutoff valve.
- 8. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 brass P-trap.
- 9. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
- 10. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.
 - a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 11. Capacities and Characteristics: See Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls and floors for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.
- C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping".
- D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Division 07 Sections.

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Install ball shutoff valve on water supply to each fixture. Install valve upstream from filter for water cooler. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping."
- D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.
- B. Adjust pressure water-cooler temperature settings.

3.5 CLEANING

- A. After installing fixture, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224716
NOVEMBER 2018

USDA FOREST SERVICE, R4

FLAMING GORGE RANGER DISTRICT OFFICE ADDITION

SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. [Advance Products & Systems, Inc.](#)
 2. [CALPICO, Inc.](#)
 3. [Metraflex Company \(The\).](#)
 4. [Pipeline Seal and Insulator, Inc.](#)

5. [Proco Products, Inc.](#)

- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: Composite.
 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6 Galvanized-steel-pipe sleeves.
 - 2. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs above Grade:
 - a. Piping Smaller Than NPS 6: PVC-pipe sleeves.
 - 4. Interior Partitions:
 - a. Piping Smaller Than NPS 6: PVC-pipe sleeves.

END OF SECTION 230517
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 230519 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

- 1.1 SUMMARY, Section Includes:
1. Liquid-in-glass thermometers.
 2. Thermowells.
 3. Dial-type pressure gages.
 4. Gage attachments.
 5. Venturi flowmeters.
- 1.2 MEASUREMENT & PAYMENT
- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.
- 1.3 SUBMITTALS
- A. Product Data: For each type of product indicated.
- B. Wiring Diagrams: For power, signal, and control wiring.
- C. Product certificates.
- D. Operation and maintenance data.

PART 2 - PRODUCTS

- 2.1 LIQUID-IN-GLASS THERMOMETERS
- A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Flo Fab Inc.](#)
 - b. [Miljoco Corporation.](#)
 - c. [Palmer Wahl Instrumentation Group.](#)
 - d. [Tel-Tru Manufacturing Company.](#)
 - e. [Trerice, H. O. Co.](#)
 - f. [Weiss Instruments, Inc.](#)
 - g. [Winters Instruments - U.S.](#)
 2. Standard: ASME B40.200.
 3. Case: Cast aluminum 9-inch nominal size unless otherwise indicated.
 4. Case Form: Adjustable angle unless otherwise indicated.
 5. Tube: Glass with magnifying lens and blue or red organic liquid.

6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
7. Window: Glass or plastic.
8. Stem: Aluminum and of length to suit installation.
 - a. Design for Air-Duct Installation: With ventilated shroud.
 - b. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of following:
 - a. [Ernst Flow Industries.](#)
 - b. [Marsh Bellofram.](#)
 - c. [Miljoco Corporation.](#)
 - d. [Palmer Wahl Instrumentation Group.](#)
 - e. [REOTEMP Instrument Corporation.](#)
 - f. [Watts Regulator Co.; a div. of Watts Water Technologies, Inc.](#)
 - g. [Weiss Instruments, Inc.](#)
 - h. [WIKA Instrument Corporation - USA.](#)
2. Standard: ASME B40.200.
3. Case: Plastic; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F and deg C.
7. Window: Glass or plastic.
8. Stem: Aluminum, brass, or stainless steel and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.

11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [AMETEK, Inc.; U.S. Gauge.](#)
 - b. [Ashcroft Inc.](#)
 - c. [Ernst Flow Industries.](#)
 - d. [Flo Fab Inc.](#)
 - e. [Marsh Bellofram.](#)
 - f. [Miljoco Corporation.](#)
 - g. [Noshok.](#)
 - h. [Palmer Wahl Instrumentation Group.](#)
 - i. [REOTEMP Instrument Corporation.](#)
 - j. [Tel-Tru Manufacturing Company.](#)
 - k. [Trerice, H. O. Co.](#)
 - l. [Watts Regulator Co.; a div. of Watts Water Technologies, Inc.](#)
 - m. [Weiss Instruments, Inc.](#)
 - n. [WIKA Instrument Corporation - USA.](#)
 - o. [Winters Instruments - U.S.](#)
2. Standard: ASME B40.100.
3. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Ring: Brass.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [AMETEK, Inc.; U.S. Gauge.](#)
 - b. [Ashcroft Inc.](#)
 - c. [Flo Fab Inc.](#)
 - d. [Marsh Bellofram.](#)
 - e. [Miljoco Corporation.](#)
 - f. [Noshok.](#)
 - g. [Palmer Wahl Instrumentation Group.](#)
 - h. [REOTEMP Instrument Corporation.](#)
 - i. [Tel-Tru Manufacturing Company.](#)
 - j. [Trerice, H. O. Co.](#)
 - k. [Weiss Instruments, Inc.](#)

- l. [WIKA Instrument Corporation - USA.](#)
- m. [Winters Instruments - U.S.](#)
2. Standard: ASME B40.100.
3. Case: Sealed type; plastic; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass ball with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

2.5 FLOWMETERS

A. Venturi Flowmeters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [ABB; Instrumentation and Analytical.](#)
 - b. [Gerand Engineering Co.](#)
 - c. [Hyspan Precision Products, Inc.](#)
 - d. [Preso Meters; a division of Racine Federated Inc.](#)
 - e. [S. A. Armstrong Limited; Armstrong Pumps Inc.](#)
 - f. [Victaulic Company.](#)
2. Description: Flowmeter with calibrated flow-measuring element, hoses or tubing, fittings, valves, indicator, and conversion chart.
3. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
4. Sensor: Venturi-type, calibrated, flow-measuring element; for installation in piping.
 - a. Design: Differential-pressure-type measurement for water and glycol solutions.
 - b. Construction: Bronze, brass, or factory-primed steel, with brass fittings and attached tag with flow conversion data.
 - c. Minimum Pressure Rating: 250 psig.
 - d. Minimum Temperature Rating: 250 deg F.
 - e. End Connections for NPS 2 and Smaller: Threaded.
 - f. End Connections for NPS 2-1/2 and Larger: Flanged or welded.
 - g. Flow Range: Flow-measuring element and flowmeter shall cover operating range of equipment or system served.
5. Permanent Indicators: Meter suitable for wall or bracket mounting, calibrated for connected flowmeter element, and having 6-inch- diameter, or equivalent, dial with fittings and copper tubing for connecting to flowmeter element.

- a. Scale: Gallons per minute.
 - b. Accuracy: Plus or minus 1 percent between 20 and 80 percent of scale range.
- 6. Portable Indicators: Hand-held, differential-pressure type, calibrated for connected flowmeter element and having two 12-foot hoses, with carrying case.
 - a. Scale: Gallons per minute.
 - b. Accuracy: Plus or minus 2 percent between 20 and 80 percent of scale range.
- 7. Display: Shows rate of flow.
- 8. Conversion Chart: Flow rate data compatible with sensor.
- 9. Operating Instructions: Include complete instructions with each flowmeter.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- G. Install valve and snubber in piping for each pressure gage for fluids (except steam).
- H. Install valve and syphon fitting in piping for each pressure gage for steam.
- I. Install flow indicators in piping systems in accessible positions for easy viewing.
- J. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.
- K. Install flowmeter elements in accessible positions in piping systems.
- L. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.
- M. Install permanent indicators on walls or brackets in accessible and readable positions.
- N. Install connection fittings in accessible locations for attachment to portable indicators.
- O. Install thermometers in the following locations:
 - 1. Inlet and outlet of each hydronic boiler.
 - 2. Two inlets and two outlets of each chiller.
 - 3. Inlet and outlet of each hydronic coil in air-handling units.

4. Two inlets and two outlets of each hydronic heat exchanger.
5. Inlet and outlet of each thermal-storage tank.

P. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each chiller chilled-water and condenser-water connection.
3. Suction and discharge of each pump.

3.2 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
- B. Connect flowmeter-system elements to meters.
- C. Connect flowmeter transmitters to meters.

3.3 ADJUSTING

- A. After installation, calibrate meters according to manufacturer's written instructions.
- B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each hydronic boiler shall be the following:
 1. Industrial-style, liquid-in-glass type.
- B. Thermometers at inlets and outlets of each chiller shall be the following:
 1. Industrial-style, liquid-in-glass type.
- C. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be the following:
 1. Industrial-style, liquid-in-glass type.
- D. Thermometers at inlets and outlets of each hydronic heat exchanger shall be the following:
 1. Industrial-style, liquid-in-glass type.
- E. Thermometers at inlet and outlet of each hydronic heat-recovery unit shall be the following:
 1. Industrial-style, liquid-in-glass type.
- F. Thermometers at inlet and outlet of each thermal-storage tank shall be the following:
 1. Industrial-style, liquid-in-glass type.
- G. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

- A. Scale Range for Chilled-Water Piping: 0 to 100 deg F and minus 20 to plus 50 deg C.

- B. Scale Range for Condenser-Water Piping: 0 to 150 deg F and minus 20 to plus 70 deg C.
- C. Scale Range for Heating, Hot-Water Piping: 0 to 250 deg F and 0 to 150 deg C.
- D. Scale Range for Steam and Steam-Condensate Piping: 0 to 250 deg F and 0 to 150 deg C.

3.6 PRESSURE-GAGE SCHEDULE

- A. Pressure gages at inlet and outlet of each chiller ground loop water connection shall be one of the following:
 - 1. Liquid-filled, direct -mounted, metal case.
 - 2. Sealed, direct -mounted, plastic case.
- B. Pressure gages at suction and discharge of each pump shall be one of the following:
 - 1. Liquid-filled, direct -mounted, metal case.
 - 2. Sealed, direct -mounted, plastic case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

- A. Scale Range for Ground Loop Piping: 0 to 100 psi.

3.8 FLOWMETER SCHEDULE

- A. Flowmeters for Ground Loop Piping: Venturi type.

END OF SECTION 230519
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. High-performance butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Bronze globe valves.

- B. Related Sections: Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to HVAC valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
 2. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 2. Butterfly Valves: With extended neck.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Solder Joint: With sockets according to ASME B16.18.
 - 3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

- A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
 - d. Hammond Valve.
 - e. Jamesbury; a subsidiary of Metso Automation.
 - f. Kitz Corporation.
 - g. Legend Valve.
 - h. Milwaukee Valve Company.
 - i. NIBCO INC.
 - j. Red-White Valve Corporation.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Forged brass.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Brass.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

2.3 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. Crane Co.; Crane Valve Group; Crane Valves.
 - d. Hammond Valve.
 - e. Legend Valve.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Red-White Valve Corporation.
 - i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel.
 - i. Ball: Stainless steel, vented.
 - j. Port: Full.

2.4 HIGH-PERFORMANCE BUTTERFLY VALVES

A. Class 150, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
 - b. Bray Controls; a division of Bray International.
 - c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
 - d. Crane Co.; Crane Valve Group; Flowseal.
 - e. Crane Co.; Crane Valve Group; Stockham Division.
 - f. Hammond Valve.
 - g. Jamesbury; a subsidiary of Metso Automation.
 - h. Milwaukee Valve Company.
 - i. NIBCO INC.
 - j. Tyco Valves & Controls; a unit of Tyco Flow Control.
2. Description:
 - a. Standard: MSS SP-68.
 - b. CWP Rating: 285 psig at 100 deg F.
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

- d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
- e. Seat: Reinforced PTFE or metal.
- f. Stem: Stainless steel; offset from seat plane.
- g. Disc: Carbon steel.
- h. Service: Bidirectional.

2.5 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Red-White Valve Corporation.
 - i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: PTFE or TFE.

C. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.
 - g. NIBCO INC.
 - h. Red-White Valve Corporation.
2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 300 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

D. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 300 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: PTFE or TFE.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Kitz Corporation.
 - f. Legend Valve.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:

- a. Standard: MSS SP-71, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Design: Clear or full waterway.
- e. Body Material: ASTM A 126, gray iron with bolted bonnet.
- f. Ends: Flanged.
- g. Trim: Bronze.
- h. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Stockham Division.
- 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. NPS 14 to NPS 24, CWP Rating: 150 psig.
 - d. Body Design: Clear or full waterway.
 - e. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - f. Ends: Flanged.
 - g. Trim: Composition.
 - h. Seat Ring: Bronze.
 - i. Disc Holder: Bronze.
 - j. Disc: PTFE or TFE.
 - k. Gasket: Asbestos free.

C. Class 250, Iron Swing Check Valves with Metal Seats:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
- 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 500 psig.
 - c. NPS 14 to NPS 24, CWP Rating: 300 psig.
 - d. Body Design: Clear or full waterway.
 - e. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - f. Ends: Flanged.
 - g. Trim: Bronze.
 - h. Gasket: Asbestos free.

2.7 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [Crane Co.](#); Crane Valve Group; Crane Valves.
- b. [Crane Co.](#); Crane Valve Group; Stockham Division.
- c. [Hammond Valve.](#)
- d. [Kitz Corporation.](#)
- e. [Milwaukee Valve Company.](#)
- f. [NIBCO INC.](#)
- g. [Powell Valves.](#)
- h. [Red-White Valve Corporation.](#)
- i. [Watts Regulator Co.](#); a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded or solder joint.
- e. Stem and Disc: Bronze.
- f. Packing: Asbestos free.
- g. Handwheel: Malleable iron.

B. Class 125, Bronze Globe Valves with Nonmetallic Disc:

1. [Manufacturers](#): Subject to compliance with requirements, provide products by one of the following:

- a. [Crane Co.](#); Crane Valve Group; Crane Valves.
- b. [Crane Co.](#); Crane Valve Group; Stockham Division.
- c. [NIBCO INC.](#)
- d. [Red-White Valve Corporation.](#)

2. Description:

- a. Standard: MSS SP-80, Type 2.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded or solder joint.
- e. Stem: Bronze.
- f. Disc: PTFE or TFE.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron.

C. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. [Manufacturers](#): Subject to compliance with requirements, provide products by one of the following:

- a. [Crane Co.](#); Crane Valve Group; Crane Valves.
- b. [Hammond Valve.](#)
- c. [Kitz Corporation.](#)
- d. [Milwaukee Valve Company.](#)
- e. [NIBCO INC.](#)
- f. [Powell Valves.](#)
- g. [Red-White Valve Corporation.](#)
- h. [Watts Regulator Co.](#); a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 2.
- b. CWP Rating: 300 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
- d. Ends: Threaded.
- e. Stem: Bronze.
- f. Disc: PTFE or TFE.

- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball or butterfly valves.
 - 2. Throttling Service: Globe valves.
 - 3. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
 - b. NPS 2-1/2 and Larger: Iron swing check valves with lever and weight or with spring.

- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 6. For Steel Piping, NPS 5 and Larger: Flanged ends.

END OF SECTION 230523
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FLAMING GORGE RANGER DISTRICT OFFICE ADDITION

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.4 SUBMITTALS

1. Product Data: For each type of product indicated.
2. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Copper Pipe Hangers:
 - 1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
 - 2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structure. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- L. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - 5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor, unless shown otherwise on drawings.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 - 2. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

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SECTION 230548.13 - VIBRATION CONTROLS FOR HVAC

PART 1 - GENERAL

- 1.1 SUMMARY, Section Includes:
 - 1. Elastomeric hangers.
- 1.2 SUBMITTALS
 - A. Product Data: For each type of product.
 - B. Delegated-Design Submittal: For each vibration isolation device.
 - 1. Include design calculations for selecting vibration isolators.

PART 2 - PRODUCTS

- 2.1 ELASTOMERIC HANGERS
 - A. Elastomeric Mount in a Steel Frame with Upper and Lower Steel Hanger Rods:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ace Mountings Co., Inc.
 - b. California Dynamics Corporation.
 - c. Isolation Technology, Inc.
 - d. Kinetics Noise Control, Inc.
 - e. Mason Industries, Inc.
 - f. Vibro-Accoustics.
 - g. Vibration Eliminator Co., Inc.
 - h. Vibration Mountings & Controls, Inc.
 - 2. Frame: Steel, fabricated with a connection for an upper threaded hanger rod and an opening on the underside to allow for a maximum of 30 degrees of angular lower hanger-rod misalignment without binding or reducing isolation efficiency.
 - 3. Dampening Element: Molded, oil-resistant rubber, neoprene, or other elastomeric material with a projecting bushing for the underside opening preventing steel to steel contact.

PART 3 - EXECUTION

- 3.1 VIBRATION CONTROL DEVICE INSTALLATION
 - A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Division 03.
 - B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 230548.13

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SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Duct labels.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTAL

1. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Label Content: Include equipment's Drawing designation or unique equipment number, and pertinent information (cfm, static pressure, MBH capacity, etc.)

2.2 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings and pipe size.
 - 1. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 15 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:
 - 1. Refrigerant Piping:
 - a. Background Color: Blue.
 - b. Letter Color: White.
 - 2. Coil Condensate Piping:
 - a. Background Color: Green.
 - b. Letter Color: White.

END OF SECTION 230553
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

- A. Balancing Air Systems: Constant-volume air systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.4 SUBMITTALS

- A. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- B. Certified TAB reports.

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB or TABB.
 - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB or TABB.
 - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB or TABB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

- C. TAB Report Forms: Use standard TAB contractor's forms approved by the Engineer.
- D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine equipment performance data including fan curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- F. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- G. Examine test reports specified in individual system and equipment Sections.
- H. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- I. Examine terminal units, such as fan coil units and branch selector boxes, and verify that they are accessible and their controls are connected and functioning.
- J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

- K. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- L. Examine operating safety interlocks and controls on HVAC equipment.
- M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance dampers are open.
 - 5. Isolating valves are open and thermal expansion valves are operational.
 - 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", or SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.
 - 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation" and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.

- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- E. Verify that motor starters are equipped with properly sized thermal protection.
- F. Check dampers for proper position to achieve desired airflow path.
- G. Check for airflow blockages.
- H. Check condensate drains for proper connections and functioning.
- I. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 - 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 - 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 - 1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 - 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.

3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 PROCEDURES FOR HEAT RECOVERY UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record compressor data.

3.8 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each refrigerant coil:
 1. Dry-bulb temperature of entering and leaving air.
 2. Wet-bulb temperature of entering and leaving air.
 3. Airflow.
 4. Air pressure drop.
 5. Refrigerant suction pressure and temperature.

3.9 TOLERANCES

- A. Set HVAC system's air flow rates within the following tolerances:
 - 1. Supply Fans and Equipment with Fans: Plus or minus 10 percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.

3.10 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB contractor.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Conditions of filters.
 - b. Cooling coil, wet- and dry-bulb conditions.
 - c. Fan drive settings including settings and percentage of maximum pitch diameter.
 - d. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, and return airflows.
 2. Duct, outlet, and inlet sizes.
 3. Fan coil.
 4. Balancing stations.
 5. Position of balancing devices.

3.12 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, concealed return located in unconditioned space.
- B. Related Sections:
 - 1. Section 230719 "HVAC Piping Insulation."
 - 2. Section 233113 "Metal Ducts" for duct liners.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements provide one of the following:
 - a. CertainTeed Corp.; Commercial Board.
 - b. Fibrex Insulations Inc.; FBX.
 - c. Johns Manville; 800 Series Spin-Glas.
 - d. Knauf Insulation; Insulation Board.
 - e. Manson Insulation Inc.; AK Board.
 - f. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
 - d. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
 - b. Eagle Bridges - Marathon Industries; 550.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
 - d. Mon-Eco Industries, Inc.; 55-50.
 - e. Vimasco Corporation; WC-1/WC-5.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: 60 percent by volume and 66 percent by weight.
 5. Color: White.

2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: Aluminum.
 6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

2.6 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [ABI, Ideal Tape Division; 428 AWF ASJ.](#)
 - b. [Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.](#)
 - c. [Compac Corporation; 104 and 105.](#)
 - d. [Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.](#)
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [ABI, Ideal Tape Division; 491 AWF FSK.](#)
 - b. [Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.](#)
 - c. [Compac Corporation; 110 and 111.](#)
 - d. [Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.](#)
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [ABI, Ideal Tape Division; 488 AWF.](#)
 - b. [Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.](#)
 - c. [Compac Corporation; 120.](#)
 - d. [Venture Tape; 3520 CW.](#)
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.

2.7 SECUREMENTS

A. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - 1) [AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.](#)
 - 2) [GEMCO; Perforated Base.](#)
 - 3) [Midwest Fasteners, Inc.; Spindle.](#)
 - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
2. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - 1) [AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.](#)
 - 2) [GEMCO; Peel & Press.](#)
 - 3) [Midwest Fasteners, Inc.; Self Stick.](#)
 - b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - d. Adhesive-backed base with a peel-off protective cover.
3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
4. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
 - 1) [AGM Industries, Inc.; RC-150.](#)
 - 2) [GEMCO; R-150.](#)
 - 3) [Midwest Fasteners, Inc.; WA-150.](#)
 - 4) [Nelson Stud Welding; Speed Clips.](#)
 - b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel.

1. **Products:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [C & F Wire.](#)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 - 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 - 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 - 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
- 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
 - 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 - 6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed return located in unconditioned space.
 - 2. Indoor, exposed return located in unconditioned space.
 - 3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 4. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 - 5. Outdoor, exposed supply and return.
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums and casings.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.
 - 7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE – See Drawings.

END OF SECTION 230713

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following HVAC piping systems:
 - 1. Ground loop water piping, indoors.
 - 2. Refrigerant suction and hot-gas piping, indoors.
- B. Related Sections:
 - 1. Section 230713 "Duct Insulation."
 - 2. Section 230716 "HVAC Equipment Insulation."

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

- C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Aeroflex USA, Inc.; Aerocel.](#)
 - b. [Armacell LLC; AP Armaflex.](#)
 - c. [K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.](#)
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Fibrex Insulations Inc.; Coreplus 1200.](#)
 - b. [Johns Manville; Micro-Lok.](#)
 - c. [Knauf Insulation; 1000-Degree Pipe Insulation.](#)
 - d. [Manson Insulation Inc.; Alley-K.](#)
 - e. [Owens Corning; Fiberglas Pipe Insulation.](#)
 - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
 - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.](#)

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Aeroflex USA, Inc.; Aeroseal.](#)
 - b. [Armacell LLC; Armaflex 520 Adhesive.](#)
 - c. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.](#)
 - d. [K-Flex USA; R-373 Contact Adhesive.](#)
 - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.](#)
 - b. [Eagle Bridges - Marathon Industries; 225.](#)
 - c. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.](#)
 - d. [Mon-Eco Industries, Inc.; 22-25.](#)

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.](#)
 - b. [Eagle Bridges - Marathon Industries; 225.](#)
 - c. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.](#)
 - d. [Mon-Eco Industries, Inc.; 22-25.](#)
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Dow Corning Corporation; 739, Dow Silicone.](#)
 - b. [Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.](#)
 - c. [P.I.C. Plastics, Inc.; Welding Adhesive.](#)
 - d. [Speedline Corporation; Polycro VP Adhesive.](#)
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.](#)
 - b. [Vimasco Corporation; 749.](#)
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. **Products:** Subject to compliance with requirements, provide one of the following:
 - a. [Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.](#)
 - b. [Eagle Bridges - Marathon Industries; 550.](#)
 - c. [Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.](#)
 - d. [Mon-Eco Industries, Inc.; 55-50.](#)
 - e. [Vimasco Corporation; WC-1/WC-5.](#)
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: 60 percent by volume and 66 percent by weight.

5. Color: White.

2.5 SEALANTS

- A. Joint Sealants:
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: White.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.
 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
 - b. Vimasco Corporation; Elastafab 894.

2.8 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White.
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

- a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 370 White PVC tape.
 - b. Compac Corporation; 130.
 - c. Venture Tape; 1506 CW NS.
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.

2.10 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.062-inch soft-annealed, galvanized steel.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. C & F Wire.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover

assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
 1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.7 FIELD-APPLIED JACKET INSTALLATION

- A. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE – See Drawings.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed: None.
- D. Piping, Exposed: PVC: 30 mils thick.

END OF SECTION 230719
NOVEMBER 2018

USDA FOREST SERVICE, R4

FLAMING GORGE RANGER DISTRICT OFFICE ADDITION

SECTION 231126 - FACILITY LIQUEFIED-PETROLEUM GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. For Piping Containing Only Vapor:
 - a. Piping and Valves: 125 psig unless otherwise indicated.

B. LPG System Pressure within Buildings: One pressure range. 0.5 psig or less.

C. Seismic Performance: Vaporizers and storage container supports shall withstand the effects of earthquake motions determined according to SEI/ASCE 7

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedules 40, Type E or S, Grade B.
1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.
- B. Corrugated, Stainless-Steel Tubing: Comply with ANSI/IAS LC 1.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. FlashShield Products; Gastite, a division of Titeflex Corp.
 - b. OmegaFlex, Inc.
 - c. Parker Hannifin Corporation.
 - d. Tru-Flex Metal Hose Corp.
 - e. Ward Manufacturing LLC.
 2. Tubing: ASTM A 240/A 240M, corrugated, Series 300 stainless steel.
 3. Coating: PE with flame retardant.
 - a. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1) Flame-Spread Index: 25 or less.
 - 2) Smoke-Developed Index: 50 or less.
 4. Fittings: Copper-alloy mechanical fittings with ends made to fit and listed for use with corrugated stainless-steel tubing and capable of metal-to-metal seal without gaskets. Include brazing socket or threaded ends complying with ASME B1.20.1.
 5. Striker Plates: Steel, designed to protect tubing from penetrations.
 6. Manifolds: Malleable iron or steel with factory-applied protective coating. Threaded connections shall comply with ASME B1.20.1 for pipe inlet and corrugated tubing outlets.
 7. Operating-Pressure Rating: 5 psig.
- C. Annealed-Temper Copper Tube: Comply with ASTM B 88, Type K.
1. Copper Fittings: ASME B16.22, wrought copper, and streamlined pattern.
 2. Flare Fittings: Comply with ASME B16.26 and SAE J513.
 - a. Copper fittings with long nuts.
 - b. Metal-to-metal compression seal without gasket.
 - c. Dryseal threads complying with ASME B1.20.3.
 3. Protective Coating for Underground Tubing: Factory-applied, extruded PE a minimum of 0.022 inch thick.

2.2 PIPING SPECIALTIES

- A. Flexible Piping Joints:

1. Approved for LPG service.
2. Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
3. Minimum working pressure of 250 psig and 250 deg F operating temperature.
4. Threaded-end connections to match equipment connected and shall be capable of minimum 3/4-inch misalignment.
5. Maximum 36-inch length for liquid LPG lines.

B. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
4. Corrugated stainless-steel tubing with polymer coating.
5. Operating-Pressure Rating: 0.5 psig.
6. End Fittings: Zinc-coated steel.
7. Threaded Ends: Comply with ASME B1.20.1.
8. Maximum Length: 72 inches

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller.
3. Strainer Screen: 40 -mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

2.3 JOINING MATERIALS

A. Joint Compound and Tape: Suitable for LPG.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M.

2.4 MANUAL GAS SHUTOFF VALVES

A. See "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.
 - c. BrassCraft Manufacturing Co.; a Masco company.
 - d. Lyall, R. W. & Company, Inc.
 - e. Perfection Corporation.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.

5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig.
9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
10. Service: Suitable for LPG service with "WOG" indicated on valve body.

C. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Lee Brass Company.
2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig.
7. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
8. Service: Suitable for LPG service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for LPG.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Actaris.
 - b. American Meter Company.
 - c. Eclipse Innovative Thermal Technologies.
 - d. Fisher Control Valves & Instruments; a brand of Emerson Process Management.
 - e. Invensys.
 - f. Itron Gas.
 - g. Maxitrol Company.
 - h. Pietro Fiorentini.
 - i. Richards Industries.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.

8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 10 psig

2.6 DIELECTRIC UNIONS

A. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Capitol Manufacturing Company.
 - c. Central Plastics Company.
 - d. HART Industrial Unions, LLC.
 - e. Jomar Valve.
 - f. Matco-Norca.
 - g. WATTS.
 - h. Wilkins.
2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

2.7 LABELING AND IDENTIFYING

- A. Detectable Warning Tape: Acid- and alkali-resistant PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Division 31 Sections.

3.2 OUTDOOR PIPING INSTALLATION

- A. Comply with NFPA 58 and the International Fuel Gas Code requirements for installation and purging of LPG piping.
- B. Install underground, LPG piping buried at least 36 inches below finished grade. Comply with requirements in Division 31 Sections.
- C. If LPG piping is installed less than 36 inches below finished grade, install it in containment conduit.

- D. Steel Piping with Protective Coating:
 - 1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
 - 3. Replace pipe having damaged PE coating with new pipe.
- E. Copper Tubing with Protective Coating:
 - 1. Apply joint cover kits over tubing to cover, seal, and protect joints.
 - 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.
- F. Install fittings for changes in direction and branch connections.
- G. Install pressure gage downstream from each service regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."

3.3 INDOOR PIPING INSTALLATION

- A. Comply with the International Fuel Gas Code for installation and purging of LPG piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.
- H. Install LPG piping at uniform grade of 2 percent down toward drip and sediment traps.
- I. Install piping free of sags and bends.
- J. Install fittings for changes in direction and branch connections.
- K. Verify final equipment locations for roughing-in.
- L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
- M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where readily accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
- N. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- O. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- P. Connect branch piping from top or side of horizontal piping.
- Q. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.
- R. Do not use LPG piping as grounding electrode.
- S. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- T. Install pressure gage downstream from each line regulator. Pressure gages are specified in Section 230519 "Meters and Gages for HVAC Piping."
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, or copper connector.
- B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.
- C. Install anode for metallic valves in underground PE piping.

3.5 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 2. Cut threads full and clean using sharp dies.
 3. Ream threaded pipe ends to remove burrs and restore full ID of pipe.
 4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.

5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- D. Welded Joints:
 1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
 2. Bevel plain ends of steel pipe.
 3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Ch. 22, "Pipe and Tube."
- F. Flared Joints: Cut tubing with roll cutting tool. Flare tube end with tool to result in flare dimensions complying with SAE J513. Tighten finger tight, then use wrench. Do not overtighten.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
 1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
- D. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:
 1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
 2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
 3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod, 3/8 inch.

3.7 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install LPG piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliances and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.8 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.
- B. Install detectable warning tape directly above gas piping, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.9 FIELD QUALITY CONTROL

- A. Test, inspect, and purge LPG according to NFPA 58 and the International Fuel Gas Code and requirements of authorities having jurisdiction.
- B. LPG piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.10 OUTDOOR PIPING SCHEDULE

- A. Underground LPG vapor piping shall be one of the following:
 - 1. Schedule 40, steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
 - 2. Annealed-temper copper tube, Type L with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.
- B. Aboveground LPG vapor piping shall be one of the following:
 - 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
 - 2. Schedule 40, steel pipe with wrought-steel fittings and welded joints.
 - 3. Annealed-temper copper tube, Type L, with wrought-copper fittings and brazed joints. Coat pipe and fittings with protective coating for copper tubing.
- C. Containment Conduit: Schedule 40, steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.11 INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG

- A. Aboveground, branch piping NPS 1 and smaller shall be one of the following:
 - 1. Corrugated stainless-steel tubing with mechanical fittings having socket or threaded ends to match adjacent piping.
 - 2. Annealed-temper copper tube with wrought-copper fittings and brazed or flared joints.
 - 3. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping shall be one of the following:
 - 1. Schedule 40, steel pipe with malleable-iron fittings and threaded joints.
 - 2. Schedule 40, steel pipe with wrought-steel fittings and welded joints.

3.12 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe NPS 2 and smaller at service meter shall be one of the following:
 - 1. Two-piece, full -port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.

- B. Distribution piping valves for pipe NPS 2 and smaller shall be one of the following:
 - 1. Two-piece, full -port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.

- C. Valves in branch piping for single appliance shall be one of the following:
 - 1. Two-piece, full -port, bronze ball valves with bronze trim.
 - 2. Bronze plug valve.

END OF SECTION 231126
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY, Section Includes:

- 1. Refrigerant pipes and fittings.
- 2. Refrigerant piping valves and specialties.
- 3. Refrigerants.

1.3 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.4 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty.
 - 1. Include pressure drop, based on manufacturer's test data, for the following:
 - a. Thermostatic expansion valves.
 - b. Solenoid valves.
 - c. Hot-gas bypass valves.
 - d. Filter dryers.
 - e. Strainers.
 - f. Pressure-regulating valves.
- B. Shop Drawings:
 - 1. Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes; flow capacities; valve arrangements and locations; slopes of horizontal runs; oil traps; double risers; wall and floor penetrations; and equipment connection details.
 - 2. Show piping size and piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
 - 3. Show interface and spatial relationships between piping and equipment.
- C. Welding certificates.
- D. Field quality-control reports.

- E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to 2010 ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

- A. Store piping with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
 - 2. Suction Lines for Heat-Pump Applications: 535 psig.
 - 3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 88, Type K or L] or ASTM B 280, Type ACR].
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8/A5.8M.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
 - 4. Working Pressure Rating: Factory test at minimum 500 psig.
 - 5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Heldon Products; Henry Technologies.
 - c. Parker Hannifin Corp.
 - d. Paul Mueller Company.
2. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
3. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
4. Operator: Rising stem and hand wheel.
5. Seat: Nylon.
6. End Connections: Socket, union, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Heldon Products; Henry Technologies.
 - c. Parker Hannifin Corp.
 - d. Paul Mueller Company.
2. Body and Bonnet: Forged brass or cast bronze.
3. Packing: Molded stem, back seating, and replaceable under pressure.
4. Operator: Rising stem.
5. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
6. Seal Cap: Forged-brass or valox hex cap.
7. End Connections: Socket, union, threaded, or flanged.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - d. Parker Hannifin Corp.
 - e. Paul Mueller Company.
2. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
3. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
4. Piston: Removable polytetrafluoroethylene seat.
5. Closing Spring: Stainless steel.
6. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
7. End Connections: Socket, union, threaded, or flanged.
8. Maximum Opening Pressure: 0.50 psig.
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - d. Parker Hannifin Corp.
 - e. Paul Mueller Company.
 - f. Refrigeration Sales, Inc.
2. Body: Forged brass with brass cap including key end to remove core.
3. Core: Removable ball-type check valve with stainless-steel spring.
4. Seat: Polytetrafluoroethylene.
5. End Connections: Copper spring.
6. Working Pressure Rating: 500 psig.

E. Thermostatic Expansion Valves: Comply with AHRI 750.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - d. Paul Mueller Company.
2. Body, Bonnet, and Seal Cap: Forged brass or steel.
3. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
4. Packing and Gaskets: Non-asbestos.
5. Capillary and Bulb: Copper tubing filled with refrigerant charge.
6. Suction Temperature: 40 deg F].
7. Superheat: Adjustable]].
8. Reverse-flow option (for heat-pump applications).
9. End Connections: Socket, flare, or threaded union.
10. Working Pressure Rating:] 450 psig].

F. Straight-Type Strainers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Heldon Products; Henry Technologies.
 - c. Parker Hannifin Corp.
2. Body: Welded steel with corrosion-resistant coating.
3. Screen: 100-mesh stainless steel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

G. Angle-Type Strainers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Heldon Products; Henry Technologies.
 - c. Parker Hannifin Corp.
2. Body: Forged brass or cast bronze.
3. Drain Plug: Brass hex plug.
4. Screen: 100-mesh monel.

5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

H. Moisture/Liquid Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - d. Parker Hannifin Corp.
2. Body: Forged brass.
3. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
4. Indicator: Color coded to show moisture content in parts per million (ppm).
5. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
6. End Connections: Socket or flare.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

I. Replaceable-Core Filter Dryers: Comply with AHRI 730.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - d. Parker Hannifin Corp.
2. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated alumina].
5. Designed for reverse flow (for heat-pump applications).
6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
8. Maximum Pressure Loss: 2 psig].
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

J. Permanent Filter Dryers: Comply with AHRI 730.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Danfoss Inc.
 - b. Emerson Climate Technologies.
 - c. Heldon Products; Henry Technologies.
 - d. Parker Hannifin Corp.
2. Body and Cover: Painted-steel shell.
3. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
4. Desiccant Media: Activated alumina].
5. Designed for reverse flow (for heat-pump applications).
6. End Connections: Socket.
7. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.

8. Maximum Pressure Loss: 2 psig].
9. Working Pressure Rating: 500 psig.
10. Maximum Operating Temperature: 240 deg F.

2.4 REFRIGERANTS

A. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Arkema Inc.
 - b. DuPont Fluorochemicals Div.
 - c. Genetron Refrigerants; Honeywell International Inc.
 - d. Mexichem Fluor Inc.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

- A. Suction Lines NPS 3-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.
- B. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.
- C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

- A. Install diaphragm packless or packed-angle valves in suction and discharge lines of compressor.
- B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.
- C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless or packed-angle valves on inlet and outlet side of filter dryers.
- E. Install a full-size, three-valve bypass around filter dryers.
- F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.
- G. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 1. Install valve so diaphragm case is warmer than bulb.
 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- H. Install safety relief valves where required by 2010 ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.
- I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for the device being protected:
 1. Solenoid valves.
 2. Thermostatic expansion valves.
 3. Hot-gas bypass valves.
 4. Compressor.
- K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.
- L. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Sections if valves or equipment requiring maintenance is concealed behind finished surfaces.
- L. Install refrigerant piping in protective conduit where installed belowground.

- M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- N. Slope refrigerant piping as follows:
 - 1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
 - 2. Install horizontal suction lines with a uniform slope downward to compressor.
 - 3. Install traps and double risers to entrain oil in vertical runs.
 - 4. Liquid lines may be installed level.
- O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- Q. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."
- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.
- D. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

- A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.

3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 4. Spring hangers to support vertical runs.
 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod diameters:
1. NPS 1/2: Maximum span, 60 inches; minimum rod, 1/4 inch.
 2. NPS 5/8: Maximum span, 60 inches; minimum rod, 1/4 inch.
 3. NPS 1: Maximum span, 72 inches; minimum rod, 1/4 inch.
 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod, 3/8 inch.
 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod, 3/8 inch.
 6. NPS 2: Maximum span, 96 inches; minimum rod, 3/8 inch.
 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod, 3/8 inch.
 8. NPS 3: Maximum span, 10 feet; minimum rod, 3/8 inch.
 9. NPS 4: Maximum span, 12 feet; minimum rod, 1/2 inch.
- D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Comply with ASME B31.5, Chapter VI.
 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.
- B. Prepare test and inspection reports.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
1. Install core in filter dryers after leak test but before evacuation.
 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
 - 1. Open shutoff valves in condenser water circuit.
 - 2. Verify that compressor oil level is correct.
 - 3. Open compressor suction and discharge valves.
 - 4. Open refrigerant valves except bypass valves that are used for other purposes.
 - 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY, Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".
- B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 2. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 36 inches in Diameter: Flanged.

- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.

6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- E. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.

- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
 - 3. Unconditioned Space, Return-Air Ducts: Seal Class B.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

- D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- E. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.6 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel.
- B. Supply Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 16.
 - d. SMACNA Leakage Class for Round and Flat Oval: 8.
 - 2. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 3-inch wg.
 - b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 8.
 - d. SMACNA Leakage Class for Round and Flat Oval: 4.
- C. Return Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 16.
 - d. SMACNA Leakage Class for Round and Flat Oval: 8.
- D. Elbow Configuration:
 - 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

- a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Radius-to Diameter Ratio: 1.5.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Welded.
- E. Branch Configuration:
- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: High-efficiency take-off.
 - 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity up to 1500 fpm: Conical tap.
 - b. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

- 1.1 SUMMARY, Section Includes:
1. Manual volume dampers.
 2. Flange connectors.
 3. Turning vanes.
 4. Flexible connectors.
 5. Flexible ducts.
 6. Duct accessory hardware.
- 1.2 MEASUREMENT & PAYMENT
- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.
- 1.3 SUBMITTALS
- A. Product Data: For each type of product.
- B. Operation and maintenance data.

PART 2 - PRODUCTS

- 2.1 ASSEMBLY DESCRIPTION
- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- 2.2 MATERIALS
- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G90.
 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [Air Balance Inc.; a division of Mestek, Inc.](#)
 - b. [American Warming and Ventilating; a division of Mestek, Inc.](#)
 - c. [Flexmaster U.S.A., Inc.](#)
 - d. [McGill AirFlow LLC.](#)
 - e. [Nailor Industries Inc.](#)
 - f. [Pottorff.](#)
 - g. [Ruskin Company.](#)
 - h. [Trox USA Inc.](#)
 - i. [Vent Products Company, Inc.](#)
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized -steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
 - a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

B. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [Ductmate Industries, Inc.](#)
 - 2. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Description: roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.5 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [Ductmate Industries, Inc.](#)
 - 2. [Duro Dyne Inc.](#)
 - 3. [Elgen Manufacturing.](#)
 - 4. [METALAIRE, Inc.](#)
 - 5. [SEMCO Incorporated.](#)
 - 6. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Single wall.

2.6 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [Ductmate Industries, Inc.](#)
 - 2. [Duro Dyne Inc.](#)
 - 3. [Elgen Manufacturing.](#)
 - 4. [Ventfabrics, Inc.](#)
 - 5. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.

- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.

2.7 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. [Flexmaster U.S.A., Inc.](#)
 - 2. [McGill AirFlow LLC.](#)
 - 3. ThermaFlex (Flexible Technologies, Inc.)
 - 4. [Ward Industries, Inc.; a division of Hart & Cooley, Inc.](#)
- B. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene or aluminized vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 20 to plus 210 deg F.
 - 4. Insulation R-value: Comply with latest edition of ASHRAE/IESNA 90.1.
- C. Flexible Duct Connectors:
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.

2.8 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install volume dampers at points on supply, return, and outdoor air systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install flexible connectors to connect ducts to equipment.
- G. Connect diffusers to ducts with maximum 48-inch lengths of flexible duct clamped in place.
- H. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 233713.13 - AIR DIFFUSERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Round ceiling diffusers.
 - 2. Rectangular and square ceiling diffusers.
 - 3. Louver face diffusers.
 - 4. Linear bar diffusers.
 - 5. Linear slot diffusers.
- B. Related Requirements:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
 - 2. Section 233713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND CEILING DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Krueger.
 - 2. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Steel.
- D. Finish: Baked enamel, white.
- E. Face Style: See schedule on drawings.
- F. Mounting: Duct connection.

- G. Pattern: Two-position horizontal.
- H. Dampers: Butterfly.
- I. Accessories: Operating rod extension.

2.2 RECTANGULAR AND SQUARE CEILING DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Krueger.
 - 2. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Steel.
- D. Finish: Baked enamel, white.
- E. Face Size: See schedule on drawings.
- F. Face Style: See schedule on drawings.
- G. Mounting: Surface or T-bar.
- H. Pattern: See drawings.
- I. Dampers: Butterfly.
- J. Accessories:
 - 1. Equalizing grid.
 - 2. Plaster ring.
 - 3. Safety chain.
 - 4. Wire guard.
 - 5. Sectorizing baffles.
 - 6. Operating rod extension.

2.3 LOUVER FACE DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Krueger.
 - 2. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Steel.
- D. Finish: Baked enamel, white.
- E. Face Size: See schedule on drawings.
- F. Mounting: Surface or T-bar.
- G. Pattern: See drawings.

- H. Dampers: Butterfly
- I. Accessories:
 - 1. Square to round neck adaptor.
 - 2. Operating rod extension.

2.4 LINEAR BAR DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Krueger.
 - 2. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material: Steel.
- D. Finish: Baked enamel, white.
- E. Narrow Core Spacing Arrangement: 1/8-inch- thick blades spaced 1/4 inch apart; zero or 15-degree deflection.
- F. Wide Core Spacing Arrangement: 1/8-inch- thick blades spaced 1/2 inch apart; zero or 15-degree deflection.
- G. Wide Core Spacing Arrangement: 3/16-inch- thick blades spaced 1/2 inch apart; zero or 15 -degree deflection.
- H. Pencil-Proof Core Spacing Arrangement: 3/16-inch- thick blades spaced 7/16 inch apart; 15-degree deflection.
- I. One or Two-Way Deflection Vanes: Extruded construction adjustable louvers with removable core.
- J. Frame: See schedule on drawings.
- K. Mounting: Countersunk screw or Concealed bracket or Spring clip.
- L. Damper Type: Hinged single blade.
- M. Accessories: Plaster frame, Directional vanes, Alignment pins, Core clips, Blank-off strips.

2.5 LINEAR SLOT DIFFUSERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Krueger.
 - 2. Titus.
- B. Devices shall be specifically designed for variable-air-volume flows.
- C. Material - Shell: Steel, insulated.
- D. Material - Pattern Controller and Tees: Aluminum.
- E. Finish - Face and Shell: Baked enamel, black.

- F. Finish - Pattern Controller: Baked enamel, black.
- G. Finish - Tees: Baked enamel, white.
- H. Slot Width: See schedule on drawings.
- I. Number of Slots: See schedule on drawings.
- J. Length: See schedule on drawings.
- K. Accessories: Plaster frame, T-bar slot, or T-bar clips on both sides.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install diffusers level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 233713.23 - AIR REGISTERS AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adjustable blade face registers and grilles.
2. Fixed face registers and grilles.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
2. Section 233713.13 "Air Diffusers" for various types of air diffusers.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 REGISTERS

A. Adjustable Blade Face Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Titus.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal 1/2 inch apart.
5. Rear-Blade Arrangement: Vertical.
6. Frame: 1-1/4 inches wide.
7. Mounting Frame: Filter, if scheduled on drawings.
8. Mounting: Countersunk screw or Concealed or Lay in.
9. Damper Type: Adjustable opposed blade.
10. Accessories: Filter.

B. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Titus.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Face Arrangement: Perforated core.
6. Core Construction: Integral.
7. Frame: 1-1/4 inches wide.
8. Mounting Frame: Filter, if scheduled on drawings.
9. Mounting: Countersunk screw or Lay in.
10. Damper Type: Adjustable opposed blade.
11. Accessory: Filter.

2.2 GRILLES

A. Adjustable Blade Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Titus.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal spaced 3/4 inch apart.
5. Core Construction: Integral.
6. Rear-Blade Arrangement: Vertical spaced 3/4 inch apart.
7. Frame: 1-1/4 inches wide.
8. Mounting Frame: Filter, if scheduled on drawings.
9. Mounting: Countersunk screw or Lay in.
10. Accessories:
 - a. Front -blade gang operator.
 - b. Filter.

B. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Krueger.
 - b. Titus.
2. Material: Steel.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal; spaced 3/4 inch apart.
5. Face Arrangement: Perforated core.
6. Core Construction: Integral.
7. Frame: 1-1/4 inches wide.
8. Mounting Frame: Filter, if scheduled on drawings.

- 9. Mounting: Countersunk screw or Lay in.
- 10. Accessory: Filter.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install registers and grilles level and plumb.
- B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

- A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23
NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 235416.13 - GAS-FIRED FURNACES

PART 1 - GENERAL

- 1.1 SUMMARY, Section Includes:
 - 1. Gas-fired, condensing furnaces and accessories complete with controls.
 - 2. Air filters.
- 1.2 MEASUREMENT & PAYMENT
 - A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.
- 1.3 SUBMITTALS
 - A. Product Data: For each type of product.
 - B. Shop Drawings:
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.
 - C. Operation and maintenance data.
- 1.4 WARRANTY
 - A. Special Warranty: Manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:
 - 1. Warranty Period, Commencing on Date of Substantial Completion:
 - a. Furnace Heat Exchanger: 10 years.
 - b. Integrated Ignition and Blower Control Circuit Board: Five years.
 - c. Draft-Inducer Motor: Five years.

PART 2 - PRODUCTS

- 2.1 ASSEMBLY DESCRIPTION
 - A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.
 - B. General Requirements for Noncondensing Gas-Fired Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

2.2 GAS-FIRED FURNACES, CONDENSING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carrier Corporation; a unit of United Technologies Corp.
 2. Daikin
 3. Lennox Industries, Inc.; Lennox International.
 4. Trane.
- B. Cabinet: Steel.
1. Cabinet interior around heat exchanger shall be factory-installed insulation.
 2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
 3. Factory paint external cabinets in manufacturer's standard color.
 4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- C. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.
1. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 2. Electronically controlled motor (ECM) controlled by integrated furnace/blower control.
- D. Type of Gas: LPG.
- E. Heat Exchanger:
1. Primary: Aluminized steel.
 2. Secondary: Stainless steel.
- F. Burner:
1. Gas Valve: 100 percent safety modulating main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
 2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.
- G. Gas-Burner Safety Controls:
1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
 2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
 3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.
- H. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.
- I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.
- J. Accessories:
1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.
 2. PVC Plastic Vent Materials:
 - a. PVC Plastic Pipe: Schedule 40, complying with ASTM D 1785.
 - b. PVC Plastic Fittings: Schedule 40, complying with ASTM D 2466, socket type.
 - c. PVC Solvent Cement: ASTM D 2564.
 - 1) PVC solvent cement shall have a VOC content of 510 g/L or less.
 - 2) Adhesive primer shall have a VOC content of 550 g/L or less.

- 3) Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

K. Capacities and Characteristics: See Drawings.

2.3 THERMOSTATS

- A. Controls shall comply with requirements in ASHRAE/IES 90.1, "Controls."
- B. Solid-State Thermostat: Wall-mounted, programmable, microprocessor-based unit with manual switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, and battery backup protection against power failure for program settings.
- C. Two-Stage, Heating-Cooling Thermostat: Adjustable, heating-cooling, wall-mounted unit with fan on-automatic selector.
- D. Solid-State, Combination Thermostat and Humidistat: Wall-mounted Wireless, programmable, microprocessor-based unit with automatic switching from heating to cooling and humidifying to dehumidifying, preferential rate control, seven-day programmability with minimum of four temperature presets per day, and battery backup protection against power failure for program settings.
- E. Control Wiring: Unshielded twisted-pair cabling.
 1. No. 24 AWG, 100 ohm, four pair.
 2. Cable Jacket Color: Blue.

2.4 AIR FILTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Aprilaire; Research Products Corp.
 2. Filtrete Home Filtration Products; a 3M brand.
 3. Flanders.
 4. General Filters, Inc.
 5. Permatron Corporation.
- B. Disposable Filters: 1-inch- thick fiberglass media with ASHRAE 52.2 MERV rating of 6 or higher, in sheet metal frame.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
- C. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.

- D. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
- E. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

3.2 CONNECTIONS

- A. Gas piping installation requirements are specified in Section 231126 "Liquefied Petroleum-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Vent Connection, Noncondensing, Gas-Fired Furnaces: Connect Type B vents to furnace vent connection and extend outdoors. Type B vents and their installation requirements are specified in Section 235123 "Gas Vents."
- D. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - b. CPVC Piping: Join according to ASTM D 2846/D 2846M, Appendix.
 - c. PVC Pressure Piping: Join schedule number ASTM D 1785 PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - d. Requirements for Low-Emitting Materials:
 - 1) CPVC solvent cement shall have a VOC content of 490 g/L or less.
 - 2) PVC solvent cement shall have a VOC content of 510 g/L or less.
 - 3) Adhesive primer shall have a VOC content of 550 g/L or less.
 - 4) Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Slope pipe vent back to furnace or to outside terminal.
- E. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform electrical test and visual and mechanical inspection.
 - 2. Leak Test: After installation, charge systems with refrigerant and test for leaks. Repair leaks, replace lost refrigerant, and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.

4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

END OF SECTION 235416.13

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 236313 - AIR-COOLED REFRIGERANT CONDENSERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes packaged, air-cooled refrigerant condensers for outdoor installation.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For air-cooled refrigerant condensers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carrier Corporation; a unit of United Technologies Corp.
 - 2. Daikin Applied.
 - 3. Lennox.
 - 4. Trane.

2.2 MANUFACTURED UNITS

- A. Description: Factory assembled and tested; consisting of casing, condenser coils, condenser fans and motors, and unit controls.
- B. Refrigerant: R-410A.
- C. Condenser Coil: Factory tested at 425 psig.
 - 1. Tube: Minimum 3/8-inch- diameter seamless copper. 5/8-inch- diameter seamless copper.
 - 2. Coil Fin: Aluminum.
 - 3. Circuit: To match compressors.
- D. Condenser Fans and Drives: Propeller fans with aluminum or galvanized-steel fan blades, for vertical air discharge; directly driven with permanently lubricated ball-bearing motors with integral current- and thermal-overload protection.
 - 1. Weather-proof motors with rain shield and shaft slinger.
 - 2. Extend grease lines to outside of casing.
- E. Condenser Fans and Drives: Forward-curved centrifugal fans for vertical air discharge.
 - 1. Fan on steel shaft with self-aligning ball bearings.
 - 2. V-belt drive with minimum of two belts; variable pitch drive pulley.
 - 3. Motor mounted on adjustable slide base.
- F. Operating and Safety Controls: Include condenser fan motor thermal and overload cutouts; 115-V control transformer, if required; magnetic contactors for condenser fan motors and a nonfused factory-mounted and -wired disconnect switch for single external electrical power connection.
 - 1. Fan Cycling Control: Head pressure switches.
- G. Casings: Galvanized or zinc-coated steel treated and finished with manufacturer's standard paint coating, designed for outdoor installation with weather protection for components and controls, and with the following:
 - 1. Removable panels for access to controls, condenser fans, motors, and drives.
 - 2. Plated -steel fan guards.
 - 3. Lifting eyes.

2.3 CAPACITIES AND CHARACTERISTICS: See Drawings.

2.4 MOTORS

Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in the drawings and schedules.

- 1. Enclosure Type: Totally enclosed, fan cooled.
- 2. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- 3. Mount unit-mounted disconnect switches on exterior of unit.

2.5 SOURCE QUALITY CONTROL

- A. Testing Requirements: Factory test sound-power-level ratings according to ARI 270.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
- B. Equipment Mounting:
 - 1. Install air-cooled condenser refrigerant condensers on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Division 03 Sections.
 - 2. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- C. Maintain manufacturer's recommended clearances for service and maintenance.
- D. Loose Components: Install electrical components, devices, and accessories that are not factory mounted.

3.2 CONNECTIONS

- A. Install piping adjacent to machine to allow service and maintenance.
- B. Refrigerant Piping: Connect piping to unit with pressure relief, service valve, filter-dryer, and moisture indicator on each refrigerant-circuit liquid line. Refrigerant piping and specialties are specified in Section 232300 "Refrigerant Piping."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Perform electrical test and visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Complete manufacturer's starting checklist.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 5. Verify proper airflow over coils.
- C. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- D. Air-cooled refrigerant condensers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 236313

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT OFFICE ADDITION
SECTION 238216.13 - REFRIGERANT AIR COILS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes refrigerant air coils.

1.2 MEASUREMENT & PAYMENT

- A. No separate payment will be made for the work included under this section; rather payment shall be considered to be included in the items of work listed in the Schedule of Items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- A. ASHRAE Compliance: Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

2.2 REFRIGERANT AIR COILS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carrier Corporation; a unit of United Technologies Corp.
 - 2. Daikin
 - 3. Lennox Industries, Inc.; Lennox International.
 - 4. Trane.
- B. Performance Ratings: Tested and rated according to AHRI 410 and ASHRAE 33.
- C. Minimum Working-Pressure Rating: 300 psig.
- D. Source Quality Control: Factory tested to 450 psig.
- E. Tubes: ASTM B 743 copper, minimum 0.020 inch thick.

- F. Fins: Aluminum, minimum 0.006 inch thick.
- G. Suction and Distributor Piping: ASTM B 88, Type L copper tube with brazed joints.
- H. Frames: Galvanized-steel channel frame, minimum 0.052 inch thick for slip-in or flanged mounting.
- I. Capacities and Characteristics: See Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install coils level and plumb.
- B. Install coils in metal ducts and casings constructed according to SMACNA's "HVAC Duct Construction Standards, Metal and Flexible."
- C. Connect condensate drain pan under each cooling coil.
 - 1. Construct drain pans to extend beyond coil length and width and to connect to condensate trap and drainage.
 - 2. Extend drain pan upstream and downstream from coil face.
 - 3. Extend drain pan under coil headers and exposed supply piping.
- D. Install moisture eliminators for cooling coils. Extend drain pan under moisture eliminator.
- E. Straighten bent fins on air coils.
- F. Clean coils using materials and methods recommended in writing by manufacturers, and clean inside of casings and enclosures to remove dust and debris.
- G. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- H. Install piping adjacent to coils to allow service and maintenance.
- I. Connect refrigerant piping according to Section 232300 "Refrigerant Piping."

END OF SECTION 238216.13

NOVEMBER 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Grout.
 - 3. Common electrical installation requirements.
 - 4. Hangers and supports.

1.2 SUBMITTALS

- A. Product Data:
 - 1. For any substitutions for equipment referred to by name in Division 26 specifications or the drawings.

1.3 QUALITY ASSURANCE

- A. The installation shall conform to the 2017 Edition of the National Electrical Code (NFPA 70) and to the requirements specified herein.
- B. The Contractor shall perform all work necessary and required to accomplish the task as detailed on the drawings and discussed in the installation notes. All work shall be done by a state licensed electrician.

1.4 MEASUREMENT AND PAYMENT

- A. The work in this section, including all Division 27 Communications incidentals in other electrical sections, shall be measured and paid for by one or more of the following methods as shown in the Schedule of Items:
 - 1. Incidental to the building item or included as part of other pay items or separate as shown in the Schedule of Items.
 - 2. Electrical Service and Feeder to Panel D - Lump Sum including full compensation for all labor, materials, and incidentals necessary to complete the work as shown on the drawings including all wiring, trenching, bedding, backfill, and all other incidentals necessary for a functional system. Includes all Power Company connection fees.
 - 3. Electrical Parking Lot Lighting and Damaged Com Cable - Lump Sum including full compensation for all labor, materials, and incidentals necessary to complete the work as shown on the drawings including all wiring, trenching, bedding, backfill, and all other incidentals necessary for a functional system.

PART 2 - PRODUCTS

2.1 PRODUCTS REFERRED TO BY NAME

- A. The materials referred to by trade name, make, or catalog number on the drawings shall be regarded as establishing a minimum standard of quality; substitutions of equal or greater quality can be made by submitting a data sheet of the proposed substituted item to the Contracting Officer, for approval.

2.2 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 RACEWAY AND SIMILAR PENETRATIONS (NON-FIRE RATED, NOT SLEEVED)

- A. Concrete Slabs and Walls: Core-drilled holes.
 - 1. Fill oversized holes with grout to within 1/4-inch (6 mm).
- B. Stick-built and Similar Interior-Wall Penetrations (Finished Areas): Repair wall to within 1/8-inch (3 mm) to match the surrounding wall finish.
 - 1. Allow for a small gap or flexible fill to allow expansion and contraction to minimize cracking.
- C. Aboveground, Exterior-Wall Penetrations: Seal exterior opening around the raceway or cable, using a flexible, waterproofing, joint sealant appropriate for size, depth, and color to closely match the surrounding surface. Finish interior openings, filling opening and matching the exiting surface with appropriate materials and finish quality for the space.

3.3 HANGERS AND SUPPORTS

- A. Installation:
 - 1. Comply with NECA 1 and NECA 101 for installation requirements, except as specified in this article.
 - 2. Separate dissimilar metals and metal products from contact with wood or cementitious materials by painting each metal surface in area of contact with a bituminous coating or by other permanent separation.
 - 3. Raceway Support Methods: In addition to methods described in NECA 1, EMT and, RNC and ENT (both for communications circuits only above grade), may be supported by openings through structure members, as permitted in NFPA 70.
 - 4. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
 - 5. Mounting and Anchorage of Surface-Mounted Equipment and Components (Note that surface mounting is allowed in very limited locations): Anchor and fasten electrical items and their supports to building structural elements by the following methods, unless otherwise indicated or required by Code:
 - a. To Wood: Fasten with lag screws or through bolts.
 - b. To New Concrete: Bolt to concrete inserts.
 - c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - d. To Existing Concrete: Expansion anchor fasteners.
 - e. To Steel: Welded, threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.

- f. To Light Steel: Sheet metal screws.
 - g. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount on slotted-channel racks attached to substrate.
- 6. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

END OF SECTION 260500
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Copper building wire rated 600 V or less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
- B. Related Requirements:
 - 1. Division 27 Specification Sections for twisted pair cabling.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
- D. Conductor Insulation:
 - 1. Type THHN/THWN-2: Comply with UL 83.
 - 2. Type XHHW-2: Comply with UL 44.
- E. Cable: Comply with NEMA WC 70/ICEA S-95-658 for:
 - 1. Armored cable, Type AC.
 - 2. Metal-clad cable, Type MC.
 - 3. Submit cables with ground wire for light drops for consideration.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Circuits: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 - 1. Aluminum is not allowed.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Feeders: Type THHN/THWN-2 or XHHW, single conductors in raceway.
- B. Exposed Branch Circuits: Type THHN/THWN-2, single conductors in raceway; Armored cable, Type AC; and Metal-clad cable, Type MC.
- C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway; Armored cable, Type AC; and Metal-clad cable, Type MC.
- D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2 or XHHW-2, single conductors in raceway.
 - 1. Circuits Concealed in Concrete may also be an approved wiring method sleeved in RNC.
- E. Cord Drops for Lighting Connections are allowed.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
 - 1. Surface mounting is allowed in mechanical room.
 - 2. Surface mounted raceways may be installed above HVAC equipment if concealed by said equipment, on or below ceilings.
 - 3. Other locations shall require special permission form the Contracting Officer and may require additional requirements before allowed.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.

2.3 CONNECTORS

- A. Listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to a ground bus. Install a main bonding jumper between the neutral and ground buses.
- B. Install telephone service ground and any ground from the communications room to the same ground bus.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode from rebar as shown and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rod: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- C. Concrete-Encased Grounding Electrode (Ufer Ground): Fabricate according to NFPA 70; use bare copper conductor not smaller than No. 4 AWG or as indicated on the drawings, whichever is largest.
 - 1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
 - 2. Bond to all electrically conductive coated steel reinforcing bars or rods in footing.
 - a. If reinforcing is in multiple pieces, connect footing reinforcing together by the usual steel tie wires (two wraps minimum) and bond to conductor in at least three locations with rebar clamps, or connect together with exothermic welding.
- D. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

END OF SECTION 260526
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FLAMING GORGE RANGER DISTRICT ADDITION

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings.
 - 2. Nonmetallic conduits and fittings.
 - 3. Boxes, enclosures, and cabinets.
 - 4. Handholes and boxes for exterior underground cabling.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.
 - 2. Section 270528 "Pathways for Communications Systems" for communications systems.

1.2 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.
- B. IMC: Intermediate metal conduit.

1.3 SUBMITTALS

- A. Product Data: For floor boxes, and handholes.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:
 - 1. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. GRC: Comply with ANSI C80.1 and UL 6.
 - 3. IMC: Comply with ANSI C80.6 and UL 1242.
 - 4. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit or IMC.
 - a. Comply with NEMA RN 1.
 - b. Coating Thickness: 0.040 inch (1 mm), minimum.
 - 5. EMT: Comply with ANSI C80.3 and UL 797.
 - 6. FMC: Comply with UL 1; zinc-coated steel.
 - 7. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings:
 - 1. Comply with NEMA FB 1 and UL 514B.
 - 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 3. Fittings, General: Listed and labeled for type of conduit, location, and use.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
3. LFNC: Comply with UL 1660.
4. Rigid HDPE: Comply with UL 651A.
5. Continuous HDPE: Comply with UL 651A.

B. Nonmetallic Fittings:

1. Fittings, General: Listed and labeled for type of conduit, location, and use.
2. Fittings for RNC: Comply with NEMA TC 3; match to conduit type and material.
 - a. Fittings for LFNC: Comply with UL 514B.
3. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1,, Type FD, with gasketed cover.

1. Nonmetallic may be used where embedded in concrete

D. Metal Floor Boxes:

1. Material: Cast metal or sheet metal.
2. Type: Semi-adjustable.
3. Shape: Rectangular.
4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Nonmetallic Floor Boxes: Nonadjustable, rectangular.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

G. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Standard: Comply with SCTE 77.
4. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
5. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
6. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

7. Cover Legend: Molded lettering, "ELECTRIC" or "TELEPHONE" or "COMMUNICATIONS" based on usage.
- B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of fiberglass.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC or IMC.
 - a. Feeders and Branch Circuits: EMT allowed with UL listed raintight compression fittings, once the metal raceway is 6-inch (150-mm) minimum above finished grade.
 2. Concealed Conduit, Aboveground: GRC, IMC, or EMT.
 - a. Embedded in Concrete: RNC also allowed.
 3. Underground Conduit: GRC or IMC.
 - a. Once direct buried beyond 5-ft (1.5-m) of exposed grade penetration or building foundation penetration: HDPE; or RNC, Type EPC-40-PVC direct buried.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC or LFNC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or Type 4.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: Rigid metallic conduit or tubing.
 2. Concealed in Ceilings and Interior Walls and Partitions: Rigid metallic conduit or tubing, or approved cable method, see section 260519.
 - a. Embedded in Concrete: RNC also allowed as conduit or sleeving.
 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 4. Boxes and Enclosures: NEMA 250, Type 1.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Install surface raceways only where indicated on Drawings.

3.2 HANDHOLE APPLICATION

- A. Application of Handholes and Boxes for Underground Wiring:
1. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

3.3 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Do not fasten conduits within 4-inches of the bottom side of roof deck.
- C. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- D. Complete raceway installation before starting conductor installation.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- G. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Raceways Buried Below Slabs:
 - 1. Raceways remaining within the building footprint may transition to RNC below floor.
 - 2. Do not partially embed horizontal raceways in concrete slab unless specifically approved by Contracting Officer for each specific location.
- I. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- L. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- M. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- N. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- O. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches (915 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
- P. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- Q. Horizontally separate boxes mounted on opposite sides of fire rated walls so they are not in the same vertical channel.
- R. Locate boxes so that cover or plate will not span different building finishes.
- S. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- T. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- U. Set metal floor boxes level and flush with finished floor surface.

- V. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.4 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit.
2. All backfill shall be free of materials that may damage the conduit system, such as construction waste, large rocks, sharp rocks, etc. Where natural backfill poses a hazard, alternate backfill material is required.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment. See 3.1 A.3. this section, for building entrances.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.5 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: Set covers 1 inch (25 mm) above finished grade.

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for warning labels and signs.
 - 2. Labels.
 - 3. Tapes.
 - 4. Tags.
 - 5. Signs.
 - 6. Cable ties.
 - 7. Paint for identification.
 - 8. Fasteners for labels and signs.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1.
- B. Comply with NFPA 70.
- C. Comply with ANSI Z535.4 for safety signs and labels.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Warning Label Colors:
 - 1. Identify system voltage with black letters on an orange background.
- B. Warning labels and signs shall include, but are not limited to, the following legends:
 - 1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."
- C. Equipment Identification Labels:
 - 1. Black letters on a white field.

2.3 LABELS

- A. Self-Adhesive Labels: Polyester or vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
 - 1. Minimum Nominal Size:
 - a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
 - b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.

2.4 TAPES

- A. Floor Marking Tape: 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.
- B. Underground-Line Warning Tape:
 - 1. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 - 2. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE".
 - 3. Tag:
 - a. Pigmented polyolefin, bright colored, compounded for direct-burial service.
 - b. Width: 3 inches (75 mm).
 - c. Thickness: 4 mils (0.1 mm).
 - d. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
 - e. Tensile according to ASTM D 882: 30 lbf (133.4 N) and 2500 psi (17.2 MPa).

2.5 SIGNS

- A. Baked-Enamel Signs:
 - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
 - 2. 1/4-inch (6.4-mm) grommets in corners for mounting.
 - 3. Nominal Size: 7 by 10 inches (180 by 250 mm).
- B. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Engraved legend.
 - 2. Thickness:
 - a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
 - b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
 - c. Engraved legend.
 - d. Self-adhesive.
 - e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.6 CABLE TIES

- A. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D 638: 7000 psi (48.2 MPa).
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 - 5. Color: Black.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Circuit identification shall be in the form of "panel id"-"circuit number" such as "D-2."
- C. Verify identity of each item before installing identification products.
- D. Apply identification devices to surfaces that require finish after completing finish work.
- E. Self-Adhesive Labels:
 - 1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- F. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's written instructions.
- G. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches (150 to 200 mm) below finished grade.
 - 2. Install underground-line warning tape for direct-buried cables and cables in raceways.
- H. Signs:
 - 1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
 - 2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- I. Cable Ties: General purpose, for attaching tags, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- C. Workspace Indication: Apply floor marking tape or tape and stencil to finished surfaces. Show working clearances in the direction of access to live parts. Workspace shall comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- D. Warning Labels for Indoor Power and Lighting Panels: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.
- E. Equipment Identification Labels:
1. Indoor Equipment: Self-adhesive label, or Laminated acrylic or melamine plastic sign.
 2. Outdoor Equipment: Laminated acrylic or melamine sign.
 3. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of an engraved, laminated acrylic or melamine label.
 - b. Disconnects for HVAC outdoor equipment.
 - c. Point of use devices such as outlets, cubicle feed points, disconnects, switches, and lighting power feed points with circuit identification.
 - 1) Locate on device face and if similar to a device face plate, inside the device box.

END OF SECTION 260553
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Time switches.
 - 2. Photoelectric switches.
 - 3. Daylight-harvesting switching and dimming controls.
 - 4. Indoor occupancy and vacancy sensors.
 - 5. Switchbox-mounted occupancy sensors.
 - 6. Digital timer light switches.
 - 7. Outdoor motion sensors.
- B. Related Requirements:
 - 1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.
 - 1. Shop Drawings:
 - a. Interconnection diagrams showing field-installed wiring.
 - b. Include diagrams for power, signal, and control wiring.

1.3 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled as defined in NFPA 70 and marked for intended location and application.
 - 2. Contact Configuration: SPST.
 - 3. Contact Rating: 20-A ballast load, 120-/240-V ac.
 - 4. Programs: Two on-off set points on a 24-hour schedule, allowing different set points for each day of the week.
 - 5. Automatic daylight savings time changeover.
 - 6. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 PHOTOELECTRIC SWITCHES

- A. Pole Mounted Luminaires: Twistlock as called for on drawings or equal.
- B. Building Mounted Luminaires:
 - 1. Description: Solid state, with SPST contact rated for 400 VA inductive, to operate connected load, complying with UL 773, and compatible with CFL and LED lamps.
 - 2. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 3. Light-Level Monitoring Range: Where adjustability is needed: a field adjustable permanent slider, hood, or similar, to allow adjustment to approximate ranges shown on drawings.

2.3 DAYLIGHT-HARVESTING DIMMING CONTROLS

- A. System Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.
 - 1. Lighting control set point is based on two lighting conditions:
 - a. When no daylight is present (target level).
 - b. When significant daylight is present.
- B. Luminaire-Mounted Dimming Controls: Solid-state, light-level sensor unit, to detect changes in indoor lighting levels that are perceived by the eye.
- C. Electrical Components, Devices, and Accessories:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Sensor Output: 0- to 10-V dc to operate luminaires. Sensor is powered by controller unit.
 - 3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc (120 to 640 lux).

2.4 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. General Requirements for Sensors:
 - 1. Ceiling-mounted, solid-state indoor occupancy sensors.
 - 2. Passive infrared and Ultrasonic technology.
 - 3. Integrated or Separate power pack.
 - 4. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 5. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 6. Power: Line voltage.
 - 7. Contacts: Dry contacts rated for 20-A LED load at 120-V ac.
 - 8. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 - 9. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 - 10. Bypass Switch: Override the "on" function in case of sensor failure.
- B. PIR Type: Wall, ceiling, or luminaire mounted; detect occupants in coverage area by their heat and movement.
 - 1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).

2. Detection Coverage (Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
- C. Dual-Technology Type: Wall, ceiling, or luminaire mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
- D. Dual-Technology Type: Luminaire mounted only; detect occupants in coverage area using PIR and listening detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).

2.5 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Occupancy Sensor Operation: Turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
 3. Vacancy Sensor Operation: Manual turning on of lights only, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
 4. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
 5. Switch Rating: Not less than 800-VA LED load at 120 V.
 6. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
 7. Sensing Technology: PIR.
 8. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
 9. Voltage: 120 V.
 10. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
 11. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
 12. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

2.6 DIGITAL TIMER LIGHT SWITCH

- A. Description: Combination digital timer and conventional switch lighting control unit. Switchbox-mounted, backlit LCD display, with selectable time interval in [10] [20] minute increments.
 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 amps at 277-V ac for LED, and 1/4 horsepower at 120-V ac.
 2. Voltage: 120 V.

2.7 OUTDOOR MOTION SENSORS

- A. As called for on drawings or equal.

2.8 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 24 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments:
1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
2. GFCI receptacles.
3. Toggle switches.
4. Decorator-style convenience.
5. Wall switch sensor light switches with dual technology sensors.
6. Wall switch sensor light switches with passive infrared sensors.
7. Wall switch sensor light switches with ultrasonic sensors.
8. Digital timer light switches.
9. Wall-box dimmers.
10. Wall plates.
11. Floor service outlets.

1.2 DEFINITIONS

A. Abbreviations of Manufacturers' Names:

1. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
2. Leviton: Leviton Mfg. Company, Inc.
3. Pass & Seymour: Pass& Seymour/Legrand.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.3 SUBMITTALS

A. Product Data: For each type of product.

B. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.4 MEASUREMENT AND PAYMENT

A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Eaton (Arrow Hart); Construction Grade Receptacles 20A-125V NEMA 5-20R - 5362, 5362 __M.
 - 2. Hubbell Incorporated; Wiring Device-Kellems; HBL5351 (single), HBL5352 (duplex).
 - 3. Leviton Manufacturing Co., Inc.; 5891 (single), 5352 (duplex).
 - 4. Pass & Seymour/Legrand (Pass & Seymour); 5361 (single), 5362 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description:
 - 1. 125 V, 20 A, straight blade, feed-through type.
 - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
 - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles:
- C. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Eaton (Arrow Hart); VGF20.
 - 2. Hubbell Incorporated; Wiring Device-Kellems; GFR5352L.
 - 3. Leviton Manufacturing Co., Inc.; 7590.
 - 4. Pass & Seymour/Legrand (Pass & Seymour); 2095.

2.4 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
 - 1. Single Pole:
 - a. Eaton (Arrow Hart); AH1221 AC Quiet Toggle Switches.
 - b. Hubbell Incorporated; Wiring Device-Kellems; HBL1221.
 - c. Leviton Manufacturing Co., Inc.; 1221-2.
 - d. Pass & Seymour/Legrand (Pass & Seymour); CSB20AC1.

2.5 WALL SWITCH SENSOR LIGHT SWITCH, PASSIVE INFRARED

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Cooper Industries; OSW-P-1001-MV Single Level.
 - 2. Hubbell Premise Wiring; IWSZP3P.
 - 3. Leviton Manufacturing Co., Inc.; Lev-Lok series.
 - 4. Pass & Seymour/Legrand (Pass & Seymour); WSP250W.
- B. Description: Switchbox-mounted, combination, lighting-control sensor and conventional switch lighting-control unit using passive infrared technology.
 - 1. Connections: Hard wired.
 - 2. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.
 - 3. Adjustable time delay of 15 minutes, unless otherwise noted on the drawings.
 - 4. Able to be locked to Automatic-On or Manual-On mode, depending on application.
 - 5. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux).
 - 6. Comply with NEMA WD 1, UL 20, and FS W-S-896.

2.6 DIGITAL TIMER LIGHT SWITCH

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Eaton (Arrow Hart); TSW-MV Timer.
 - 2. Hubbell Incorporated; Wiring Device-Kellems; TD200.
 - 3. Leviton Manufacturing Co., Inc.; VPT34-1PZ.
- B. Description: Switchbox-mounted, combination digital timer and conventional switch lighting-control unit, with backlit digital display, with selectable time interval in five-minute increments.
 - 1. Rated 960 W at 120-V ac for tungsten lighting, 10 A at 120-V ac or 10 A at 277-V ac for fluorescent or LED lighting, and 1/4 hp at 120-V ac.

2.7 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole switching. Comply with UL 1472.
- C. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to adjust low-end dimming; capable of consistent dimming with low end not greater than 10 percent of full brightness.

2.8 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, extra duty, weather-resistant, die-cast aluminum or thermoplastic with lockable cover.

2.9 FLOOR SERVICE FITTINGS

- A. Type: Modular, flap-type, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Rectangular, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6 Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 jacks for twisted pair cable complying with requirements in Section 271513 "Communications Copper Horizontal Cabling."

2.10 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. Tighten unused terminal screws on the device.
8. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Dimmers:

1. Install dimmers within terms of their listing.
2. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install GFCI receptacles at all locations noted on the drawings, non-feed-through unless noted for feed-through protection of downstream receptacles specifically.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use durable wire markers or tags inside outlet boxes.

END OF SECTION 262726

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 265100 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Lighting fixtures.
 - 2. Lighting fixture supports.
 - 3. Lighting system stabilization.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

1.3 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

2.3 LIGHTING SYSTEM STABILIZATION

- A. Cable support system as manufactured by Grip Lock Systems (Phone 805-566-0064), or equal, for system cable horizontal support locations as shown on the drawings, including and not limited to:
 - 1. Ceiling assemblies.
 - 2. Straight cord sets.
 - 3. 3/32" 7x7 galvanized cable.
 - 4. Locks.
 - 5. Grippers.
 - 6. Track stabilizers.
 - 7. Seismic Bracing System.

- B. Color: Black where there is a choice.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures:
 - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
- B. Temporary Lighting: If it is necessary, and approved by Contracting Officer, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary.
- C. Suspended Lighting Fixture Support:
 - 1. Cables, Pendants and Rods: Brace to limit swinging where shown on the drawings.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 - 3. Continuous Rows: support shall not exceed 8-feet.
 - 4. Connect support wires or rods to building structure.
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 BRACING AND STABILIZATION INSTALLATION

- A. Stabilizer cable for swing/sway support shall be installed to all pendant or cable mounted fixtures as required.
 - 1. Attach directly with approved fitting to fixture supports 6 to 12 inches above the fixture. Height shall be consistent.
- B. Light fixture stabilizer cables shall be run from wall to wall in parallel runs with the light fixture rows.
- C. Secure cables to building structure or substantial blocking firmly attached to building structure.
- D. Submit bracing plan to Contracting Officer for consideration.
- E. Bracing may vary from that shown on the drawings; submit alternatives to Contracting Officer for consideration.
- F. Installation and connections shall be per manufacturer installation instructions.
 - 1. Install cables so sag is not noticeable between connection and support points.

3.3 IDENTIFICATION

- A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Adjust lighting and controls to operate according to requirements on drawings.
- B. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- C. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 270500 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Communications equipment coordination and installation.
 - 2. Common communications installation requirements.

1.2 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. RCDD: Registered Communications Distribution Designer.

1.3 SUBMITTALS

- A. Qualification Data: Submit qualifications and certification of installing contractor and key employees.
- B. Product Data: For any substitutions for equipment referred to by name in Division 27 specifications or the drawings.
- C. As-Built Drawings & Operation And Maintenance Manuals: As called for in the article by the same name.

1.4 QUALITY ASSURANCE

- A. A single manufactures product shall be provided for horizontal cable wiring and connectors for all systems.
 - 1. The extended manufactures warranty shall cover both copper and fiber optics cable installations see extended warranty below.
 - 2. The Contractor shall maintain current status with the warranting manufacturer, including all training requirements, for the duration of the Cable Infrastructure Project. The Contractor shall staff each installation crew with a minimum of 50% trained personnel, in accordance with their manufacturer/warranty contract agreement, to support the 25-Year System Warranty requirements.
 - 3. Manufacturers must be firms regularly engaged in the manufacture of telecommunication wiring products of types, sizes, and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years and be capable of warranting these products for twenty five years.
 - 4. Installer's Qualifications must include equipment manufacturers (copper cable and fiber optic cable) certification for product installation and at least 5 years of successful installation experience with projects utilizing telecommunication-wiring work similar to that required for this project.
 - 5. Personnel must be certified to install all wiring, terminations, and equipment, CAT 6 (or better & Fiber Optic Cable). Certification from BICSI level TE-350 or equivalent manufactures certification for installation work is the acceptable standard.
- B. General Performance: Backbone and horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- E. Grounding: Comply with ANSI-J-STD-607-A.

1.5 EXTENDED PRODUCT WARRANTY:

- A. At completion of the installation and testing and acceptance by a manufacturers certified installer, provide a manufacturer's extended product, labor and materials warranty of at least a 25 years assurance of compliant performance with any current or future application based on latest revision of ANSI/TIA/EIA-568 for the horizontal copper cable system infrastructure.
- B. After installation, the Contractor shall submit all documentation to support the warranty in accordance with the manufacturer's warranty requirements, including test results, and to apply for said warranty on behalf of the customer. The system warranty will cover the components and labor associated with the repair/replacement of any failed link as a result of a defective product when a valid warranty claim is submitted within the warranty period.

1.6 COORDINATION

- A. Coordinate arrangement, mounting, and support of communications equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."."

1.7 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 PRODUCTS REFERRED TO BY NAME

- A. The materials referred to by trade name, make, or catalog number on the drawings shall be regarded as establishing a minimum standard of quality; substitutions of equal or greater quality can be made by submitting a data sheet of the proposed substituted item to the Contracting Officer, for approval.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 BUILDING AND SIMILAR PENETRATIONS

- A. Sleeve installation for communications penetrations and, raceway and similar penetrations, and firestopping shall be treated under the requirements of Division 26 "ELECTRICAL."

3.3 AS-BUILT DRAWINGS & OPERATION AND MAINTENANCE MANUALS

- A. Keep one copy of record drawings, other than working drawings, on the site at all times during construction, and note all changes and corrections made during the construction period.
- B. Upon installations completion, prepare "Cabling Administration Drawings" and post in each Communications Room. These drawings are called for in other sections of Division 27.
- C. Supply Electrical Operation and Maintenance Manuals. Label the front cover of the manuals with the following information: The name of the project, the General Contractor, the Electrical Contractor, the date of construction, and contract number.
 - 1. Hard copy manuals: 8-1/2" x 11" size in hard cover, loose leaf, 3-ring binder. Accordion fold drawings to 8-1/2" x 11" size. Provide an index and tabs for listing contents. Arrange contents in order of their appearance in the specifications.
 - a. Provide: One copy in every communications room, plus one for permanent record.
 - 2. Electronic manual: Same information and electronic format as the hard copy with information in Adobe PDF format. The "Cabling Administration Drawings" shall also be provided in AutoCAD "dwg" format, in the same scale as the Government provided construction drawings.
 - a. Provide the Contracting Officer with two CD's, DVD's, or thumb drives compatible with standard computers running Windows 7.
 - 3. Submit a preliminary complete copy to the COR for approval at least 2 weeks prior to the final inspection.
 - 4. Include the following information as part of the operation and maintenance manuals:
 - a. Required Data:
 - 1) "Cabling Administration Drawings."
 - 2) Test and inspection reports.
 - 3) Diagrams, catalog data, parts lists, manufacturer's installation, operating and maintenance instruction manuals for all equipment and fixtures.
 - b. List major equipment with the names, addresses and telephone numbers of the equipment representative providing factory trained service personnel.
 - 5. The Government may provide CAD drawing files on DVD or CD to the contractor for creating "Cabling Administration Drawings."

END OF SECTION 270500
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USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION

SECTION 270526 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Verification of existing grounding and correction of incomplete or damages systems.
 - a. Grounding conductors.
 - b. Grounding connectors.

1.2 DEFINITIONS

- A. BCT: Bonding conductor for telecommunications.
- B. EMT: Electrical metallic tubing.
- C. TMGB: Telecommunications main grounding busbar.

1.3 SUBMITTALS

- A. Field quality-control reports: Include resistance and current test results.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 SYSTEM COMPONENTS

- A. Comply with J-STD-607-A.

2.2 CONDUCTORS

- A. Comply with UL 486A-486B.
- B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
- C. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.

2.3 CONNECTORS

- A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.
- B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
 - 1. Electroplated tinned copper, C and H shaped.

- C. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type, mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch (15.8- or 25.4-mm) centers for a two-bolt connection to the busbar.
- D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING BUSBARS

- A. Main Grounding Busbar: This normally is provided at the building exterior, but does not exist.
 - 1. For this application, the grounding busbar within the new electrical service is allowed to substitute.
- B. TMGB: Likely does not exist. One of the two following systems may be used if missing.
 - 1. Predrilled rectangular bars of hard-drawn solid copper, 1/4 by 2 inches (6.3 by 50 mm) in cross section, 12-inch (300-mm) long. The busbar shall be for wall mounting, shall be NRTL listed as complying with UL 467, and shall comply with J-STD-607-A.
 - a. Predrilling shall be with holes for use with lugs specified in this Section.
 - b. Mounting Hardware: Stand-off brackets that provide at least a 2-inch ((50-mm) clearance to access the rear of the busbar. Brackets and bolts shall be stainless steel.)
 - 2. Square D PK15GTAL ground bar kit with PKGTAB insulator kit.
- C. Rack Grounding Busbars: May not exist. One of the two following systems may be used if missing.
 - 1. Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.
 - a. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch (483- or 584-mm) equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
 - 2. Square D PK15GTAL ground bar kit mounted securely to the far post of the rack.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Comply with J-STD-607-A.

3.2 APPLICATION

- A. Conductors: Install solid conductor for bare No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Grounding and Bonding Conductors:
 - 1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
 - 2. Install without splices.
 - 3. Support at not more than 36-inch (900-mm) intervals.
 - 4. Install grounding and bonding conductors in 3/4-inch (21-mm) PVC conduit until conduit enters a telecommunications room. The grounding and bonding conductor pathway through a plenum shall be in EMT. Conductors shall not be installed in EMT unless otherwise indicated.
 - a. If a grounding and bonding conductor is installed in ferrous metallic conduit, bond the conductor to the conduit using a grounding bushing that complies with requirements in

Section 270528 "Pathways for Communications Systems," and bond both ends of the conduit to a TGB.

3.3 GROUNDING ELECTRODE SYSTEM

- A. The BCT between the TMGB and the ac service equipment ground shall not be smaller than No. 4 AWG.
 - 1. If the BCT exists, replacement is not required even if smaller conductor is used.

3.4 GROUNDING BUSBARS

- A. On backboard behind rack, install busbar horizontally, on insulated spacers, 12 inches (300 mm) above finished floor unless otherwise indicated.

3.5 CONNECTIONS

- A. Bond metallic equipment in a telecommunications equipment room to the grounding busbar in that room, using equipment grounding conductors not smaller than No. 6 AWG.
 - 1. Existing bonding conductors do not require replacement even if smaller conductors are used.
- B. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
- C. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
 - 1. Use crimping tool and the die specific to the connector.
 - 2. Pretwist the conductor.
 - 3. Apply an antioxidant compound to all bolted and compression connections.
- D. Telecommunications Enclosures and Equipment Racks: Bond metallic components of enclosures to the telecommunications bonding and grounding system. Bond the equipment grounding busbar to the TGB No. 6 AWG bonding conductors.
 - 1. Existing bonding conductors do not require replacement even if smaller conductors are used.
- E. Existing Ladder Tray and New Basket Tray Grounding: Bond to TGMB. Bond tray sections together unless tray is listed as self bonding.
 - 1. Cable Tray Equipment Grounding Wire: No. 8 AWG.
 - 2. Cable Tray Grounding Jumper:
 - a. Not smaller than No. 10 AWG and not longer than 12 inches (300 mm). If jumper is a wire, it shall have a crimped grounding lug with one hole and standard barrel for one crimp. If jumper is a flexible braid, it shall have a one- or two-hole ferrule. Attach with grounding screw or connector provided by cable tray manufacturer.
 - 3. Existing bonding conductors do not require replacement even if smaller conductors are used.
- F. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- C. Prepare test and inspection reports.

END OF SECTION 270526
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USDA FOREST SERVICE, R4
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SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Nonmetallic conduits and fittings.
 2. Surface pathways.
 3. Lacing bars, spools, D-Rings and J-Hooks
 4. Boxes, enclosures, and cabinets.

1.2 DEFINITIONS

- A. ENT: Electrical nonmetallic tubing.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Rigid conduits, tubing and fittings of 260533 – Raceways and Boxes for Electrical Systems are allowed when installed in compliance with the additional requirements of division 27 specifications.

2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. General Requirements for Nonmetallic Conduits and Fittings:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with TIA-569-B.
- B. ENT: NEMA TC 13.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Rigid HDPE: Comply with UL 651A.
- E. Continuous HDPE: Comply with UL 651B.
- F. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

2.3 SURFACE PATHWAYS

- A. General Requirements for Surface Pathways:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Prime coated, ready for field painting.
1. See drawings for approved type. Other manufacturers of comparable products may be submitted for consideration.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Mono-Systems, Inc.
- b. Niedax-Kleinhuis USA, Inc.
- c. Panduit Corp.
- d. Wiremold / Legrand.

2.4 D-RINGS AND D-HOOKS

- A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 2. Lacing bars, spools, J-hooks, and D-rings.
 3. Straps and other devices.
- B. Shall provide adequate strength for twice the applied load minimum.
- C. Where installed over 12 inches (300 mm) center to center they shall provide a minimum of 1 inch, flat or almost flat surface for cable support.
- D. If metal, they shall be galvanized steel, paint powder coated, or aluminum with clear anodized finish.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Refer to the article by the same name in 260533 – “Raceways and Boxes for Electrical Systems.” The following are additional restrictions or allowances beyond this specification:
- B. Wall-Mounted Work Station Interface Boxes - Wall mounted WAO outlet boxes shall be pressed steel 4”x 4” standard outlet boxes with proper drywall/plaster ring for wall covering, or plastic, fiberglass, or steel 2”x 4”x 3.5” extra deep box.
- C. Floor-Mounted Combination Work Station Interface Boxes - Acceptable Manufacturers of floor-mounted box outlets include the following: Wiremold, Walker, and Thomas & Betts, or an approved equal.
 1. An acceptable standard for this product is Wiremold, AC series shown below with 2 - CAT 6 Data Jacks and 2-20A receptacles.



PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

- A. Indoors: Apply pathway products as specified below unless otherwise indicated:
 1. Pathways for Horizontal Cabling General: Cable tray pathway as called for in specification 270536 – “Cable Trays for Communication Systems.” See drawings for minimal locations.
 2. Concealed in Crawl Space Exposed: D-rings or J-hooks pathway, or approved conduit. ENT is not allowed.
 3. Concealed in Interior Walls and Partitions: ENT or approved conduit.
 4. Boxes and Enclosures: NEMA 250 Type 1.
 5. Concealed In or Under Concrete Walls and Slabs: Approved non-metallic conduit. ENT is not allowed.
- B. Pathway Fittings: Compatible with pathways and suitable for use and location.

- C. Install surface pathways only where indicated on Drawings.

3.2 INSTALLATION

- A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- B. Comply with requirements in Section 260500 for hangers and supports.
- C. Unless otherwise permitted or prohibited, comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems."
- D. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.
- E. Install manufactured conduit sweeps and long-radius elbows whenever possible.
- F. Separation from EMI Sources:
 - 1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).
 - 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
 - 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
 - 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
 - 6. Separation between Communications Cables and LED Fixtures: A minimum of 5 inches (127 mm).
 - 7. Cross all power wiring at 90 degrees where possible.
- G. Conceal pathways within finished walls, ceilings, and floors unless otherwise indicated. Install pathways parallel or perpendicular to building lines unless otherwise indicated.
- H. Support conduit within 12 inches (300 mm) of enclosures to which attached.
- I. Stub-ups to pathways:
 - 1. Install pathway sleeves to access point beyond any access obstruction to another pathway type.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
 - 3. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- J. Surface Pathways:

1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
2. Install surface pathway with a minimum 2-inch (50-mm) radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches (1200 mm) and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

K. D-Rings and J-Hook Pathways:

1. For each pathway where allowed in supporting horizontal cabling leaving or entering a main cable tray pathway or other pathway:
 - a. Install the first support to support cabling within 12 inches (300 mm) of the last pathway support.
 - b. Install supports so that cables span a maximum of 30 inches (760 mm).

3.3 PATHWAY AND SIMILAR PENETRATIONS

- A. Raceways: Comply with requirements in Section 260500 "Common Work Results for Electrical Raceways and Cabling" Article "Raceway And Similar Penetrations (Non-Fire Rated, Not Sleeved)."
- B. Cable Trays and Similar: Install rectangular sleeves at penetrations.

3.4 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

END OF SECTION 270528

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SECTION 270536 - CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes Communications Main Pathways:

1. Wire-basket cable trays.

1.2 DRAWINGS

- A. The drawings, which constitute a part of these specifications, indicate the general route of wire basket support systems. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.
- B. Specifications and drawings are for assistance and guidance, but exact routing, locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 WIRE-BASKET CABLE TRAYS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Cooper B-Line, Inc. FLEXTRAY Cable Management System or comparable product by one of the following:

1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Cablofil/Legrande.
3. Chalfant Manufacturing Company.
4. Enduro Systems, Inc.
5. Mono-Systems, Inc.
6. MP Husky.
7. Niedax-Kleinhuis USA, Inc.
8. Snaketray.
9. Wiremaid Products Division; Vutec Corporation.

- B. Description:

1. Configuration: Wires are formed into a standard 2-by-4-inch (50-by-100-mm) wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.
2. Materials: High-strength-steel longitudinal wires with no bends.
 - a. Wire Basket Finish: Electrogalvanized before fabrication.
 - 1) Standard: Comply with ASTM B 633.
3. Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.
4. Sizes:
 - a. Straight sections shall be furnished in standard 118-inch (3000-mm) lengths.

- b. Wire-Basket Depth: 2-inch (50-mm) usable loading depth by 6 inches (150 mm) wide or less.
 - c. Wire-Basket Depth: 4-inch (100-mm) usable loading depth by 8 inches (200 mm) wide or more.
- 5. Connector Assemblies: Bolt welded to plate shaped to fit around adjoining tray wires and mating plate. Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.
- 6. Connector Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.
- 7. Hardware and Fasteners: Steel, zinc plated according to ASTM B 633 or better.
- C. Alternate Product: Subject to loading and capacity established by the Cooper B-Line, Inc. FLEXTRAY system as designed, provide Cable Management Solutions, Series 201 single-sided and 201D double-sided Snake Tray or comparable product.

2.2 SOURCE QUALITY CONTROL

- A. Testing: Test and inspect cable trays according to NEMA VE 1.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

- A. Wire basket cable trays are main pathways for containing communications cable. Low voltage electronic safety and security cables may also be installed. These are mounted exposed in vaulted ceiling areas.
- B. Install cable trays as a complete system, including fasteners, elbows, reducers, tees, crosses, and bonding.
- C. Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.
 - 1. Short sections of less than 3-feet may have limited accessibility.
- D. Remove burrs and sharp.
- E. Fasten cable tray supports to building structure.
- F. Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 200 lb (90 kg). Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems."
- G. Support wire-basket cable trays and similar products with center support hangers with 1/4-inch- (6-mm-) diameter rods.
 - 1. Use 3/8-inch- (10-mm-) diameter rods where rods longer than 48 inches (1200 mm) are installed or where loaded basket weight requires them.
 - 2. Do not exceed manufacturers spacing requirements.
- H. Support bus assembly to prevent twisting from eccentric loading.
- I. Locate and install supports according to NEMA VE 2. Do not install more than one cable tray splice between supports.
- J. Make changes in direction and elevation using manufacturer's recommended fittings or methods.
- K. Make cable tray connections using manufacturer's recommended fittings.
- L. Seal penetrations through fire and smoke barriers. Comply with requirements in Section 078413 "Penetration Firestopping."

3.2 CABLE INSTALLATION

- A. Install cables only when each cable tray run has been completed and inspected.

- B. Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket.
- C. Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 72 inches (1800 mm).

3.3 CONNECTIONS

- A. Connect pathways to cable trays according to requirements in NEMA VE 2.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.
 - 2. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.
 - 3. Verify that communications or data-processing circuits are separated from power circuits by barriers.
 - 4. Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.
 - 5. Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.
 - 6. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
 - 7. Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
- B. Prepare test and inspection reports.

3.5 PROTECTION

- A. Protect installed cable trays and cables.
 - 1. Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.
 - 2. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
 - 3. Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION 270536

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 271100 - COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Telecommunications mounting elements.
 2. Additional cable management at existing rack.
 3. Coordination with Government Telecommunications Representative.

1.2 DEFINITIONS

- A. LAN: Local area network.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets.
 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
1. ADC.
 2. Belden Inc.
 3. Berk-Tek Company.
 4. Cooper B-Line.
 5. Emerson Network Power Connectivity Solutions.
 6. General Cable Company.
 7. Hubbell Premise Wiring.
 8. Leviton Commercial Networks Division.
 9. Middle Atlantic Products, Inc.
 10. Ortronics, Inc.
 11. Panduit Corp.
 12. Siemon Co. (The).
 13. Tyco Electronics Corporation; AMP NETCONNECT.

2.2 EXISTING EQUIPMENT FRAMES CABLE MANAGEMENT ADDITIONS

- A. General Frame Requirements:
1. Existing Distribution Frames: Freestanding, 19-inch (480-mm) panel mounting, Two Post, Floor-Mounted Rack.

B. Additions: Cable Management for Equipment Frames.

1. Vertical cable managers shall be TE Connectivity (AMP NETCONNECT) 84-inch high, double sided, 6" wide, 8.5" deep front and rear, Standard fingers front and rear 1933534-1 gated.
 - a. Provide one vertical cable manager on near side of existing two post, floor mounted rack.
 - b. Rack may have additional mounting holes drilled to accommodate mounting of vertical cable manager.
2. Horizontal cable managers shall be TE Connectivity (AMP NETCONNECT) Horizontal 3U management panel, single sided, 5.5" deep 1933561-1 and double sided, 5.5" deep front and rear 1933562-1.
 - a. Provide double sided cable managers, one above and below each new patch panel.
3. See Specification 271200 for Rack Mounted Patch Panels.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install vertical and horizontal managers as called for.
- C. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install cable management, lacing bars and distribution spools.
- D. Coordinate rack layout and installation of communications equipment with Government's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
 1. Meet with Government telecommunications representative to exchange information and agree on details of equipment arrangements and installation interfaces. Government representative is:

William C. Savage
US Forest Service/FMST
Office (770) 297-2945
Cell (770) 519-1366
 2. Record agreements reached in meetings and distribute them to other participants.
 3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
 4. Adjust arrangements and locations of equipment with distribution frames, cross-connects, and patch panels of cabling systems of other communications, electronic safety and security, and related systems that share space in the equipment room.

3.2 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

END OF SECTION 271100
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 271200 - COMMUNICATIONS COPPER NETWORK CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. UTP cable.
 - 2. Cable connecting hardware, patch panels, and patch cords.
 - 3. Telecommunications outlet/connectors.
 - 4. Cabling and cabling system identification products.
- B. Horizontal Cabling Description:
 - 1. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.
 - a. Two telecommunications outlet/connectors shall be installed for each work area outlet unless otherwise specified on the drawings.
 - b. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
 - c. Bridged taps and splices shall not be installed in the horizontal cabling.
 - 2. A work area outlet includes the components that extend from the telecommunications outlet/connectors to the station equipment.
 - 3. The maximum allowable horizontal cable length is 295 feet (90 m). This maximum allowable length does not include an allowance for the length of 16 feet (4.9 m) to the workstation equipment or in the horizontal cross-connect.
- C. Patch Cords: Are provided under this contract.
- D. Electronic Network Devices and UPS: Network routers and similar equipment, and any UPS unless called out in a different section are not provided in this contract.

1.2 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. EMI: Electromagnetic interference.
- E. IDC: Insulation displacement connector.
- F. LAN: Local area network.
- G. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.
- H. UTP: Unshielded twisted pair.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. General Performance: Backbone and horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
- D. Grounding: Comply with ANSI-J-STD-607-A.

1.5 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

1.6 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. The cable chosen for project shall be from one manufacturer for the entire project. Use a single manufacturer and the same product where two or more units of the same class or equipment are required.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated within this section or comparable product by one of the following:
 - 1. Preapproved:
 - a. Berk-Tek; a Nexans company.
 - b. General Cable Technologies Corporation.
 - c. Legrand Ortronics.
 - d. Leviton Commercial Networks Division.
 - e. Tyco Electronics/AMP NETCONNECT; Tyco International Ltd.
 - 2. Not preapproved:
 - a. ADC.
 - b. American Technology Systems Industries, Inc.
 - c. Belden CDT Inc.; Electronics Division.
 - d. CommScope, Inc.
 - e. Draka USA.
 - f. Dynacom Corporation.
 - g. Genesis Cable Products; Honeywell International, Inc.
 - h. Hubbell Premise Wiring.
 - i. KRONE Incorporated.
 - j. Mohawk; a division of Belden CDT.
 - k. Molex Premise Networks; a division of Molex, Inc.
 - l. Nordex/CDT; a subsidiary of Cable Design Technologies.
 - m. Panduit Corp.
 - n. Siemon Co. (The).
 - o. Superior Essex Inc.
 - p. SYSTIMAX Solutions; a CommScope Inc. brand.
 - q. 3M Communication Markets Division.

2.2 GENERAL

- A. Performance Rating: Category 6 exceeding TIA/EIA-568-B.2-1 Category 6 and ISO/IEC 11801 Class E performance requirements on all parameters.
 - 1. Comply with all of the performance requirements for current and proposed applications such as Gigabit Ethernet (1000BASE-Tx), 10/100BASE-Tx, token ring, 155 Mbps ATM, 100 Mbps TP-PMD, ISDN, analog and digital video and analog and digital voice (VoIP).
 - 2. Cable performance shall be independently verified and characterized to 600 MHz. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70.
 - 3. Comply with ICEA S-90-661 for mechanical properties.
- B. Jack and cable color shall be white.

2.3 UTP CABLE

- A. Jacketing: Thermoplastic, lead free.
 - 1. Plenum CMP (NFPA 262, UL 910) and riser CMR (ANSI/UL 1666, IEC 332-1) rated where required based on installation location.
- B. Horizontal Cable: 100-ohm, four-pair UTP, 23 AWG, unshielded.
 - 1. Horizontal cable may be AMP NETCONNECT part number 219560-X, or 219567-X where X denotes color.

2.4 UTP CABLE HARDWARE

- A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
 - 1. Hardware and terminations for underground cables is in article "Input-Output Building Entrance Enclosure."
 - 2. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 - a. Number of Jacks per Field: One for each four-pair UTP cable indicated.
 - b. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks.
 - 3. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
 - a. Number of Jacks per Field: One for each four-pair UTP cable indicated.
- B. Rack Mounted Patch Panels (Distribution Frame): Standard SL Series Patch configured with 6-port modules with individually replaceable jacks. Patch panels shall terminate the building cabling on 110-style insulation displacement connectors.
 - 1. Modules shall accept 9mm and 12mm labels (included) as well as color-coded icons to indicate its function.
 - 2. Patch panels shall be Listed.
 - 3. AMP NETCONNECT: Description Height Width Part Numbers
 - a. 48-Port 2U 19.0" 1933328-X
 - b. -X denotes packaging: -1 = loaded, -2 = unloaded, jacks bagged
- C. Jacks and Jack Assemblies: Modular, SL (slim profile) Series, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
 - 1. Modular jacks shall be unkeyed, unshielded, 4-pair, RJ-45. Modular jacks shall terminate using 110-style pc board connectors, color-coded for both T568A and T568B wiring. The 110-style insulation

displacement connectors shall be capable of terminating 22-24 AWG solid or 24 AWG stranded conductors.

2. The insulation displacement contacts shall be paired, with additional space between pairs, to improve crosstalk performance. Modular jacks shall utilize a secondary PC board, separate from the signal path, for crosstalk compensation.
3. Jacks shall be terminated with a non impact compression tool that terminates and cuts all 8 conductor with one action. Impact termination devices are not acceptable.
4. Each modular jack shall be provided with a bend-limiting strain relief. The strain relief shall provide cylindrical support to limit the bend radius at the point of termination. Each jack shall incorporate an integral, hinged dust cover. Modular jacks shall be UL Listed.
5. Modular Jack Housing and 110 Connecting Blocks – Polyphenylene oxide, 94V-0 rated
 - a. Contacts – Beryllium copper, plated with 1.27µm (50µin) thick gold in localized area and 3.81µm (150µin) minimum thick matte tin in solder area over 1.27 µm (50 µin) minimum thick nickel under plate Insulation Displacement Contacts – Phosphorous bronze, plated with 3.81µm (150µin) minimum thick matte tin-lead over 1.27µm (50µin) minimum thick nickel under plate Integral Dust Cover – Polycarbonate
 - 1) Modular Jack – 750 mating cycles Voltage – -40° – 70°C (-40° – 158°F) – 150VAC max.
 - 2) 110 Contacts – 200 terminations Operating Temperature – -40° – 70°C (-40° – 158°F) - 150VAC max.
 - 3) Pull Force – 20lbs (89N)
 - b. Shield – Copper zinc alloy 260, pre-plated with bright nickel Strain Relief – Polycarbonate
6. Modular jacks may be AMP NETCONNECT part number 1375055-X, 1375187-X, 1375188-1 or 1479552-1 where X denotes color.

D. Non Impact CAT 6 RJ-45 Jack Termination Tool

1. The termination tool and jacks shall allow easily wire lacing, depress the handle, seat each wire in its proper location, and cut them to length with one operation
2. The compression tool shall have an integrated lacing fixture which maintains pair-twist right up to termination, allowing consistent terminations every time for better network performance.
3. Provide the non impact AMP NETCONNECT SL Series Termination Tool (p/n: 1725150-1) or approved equal.

E. Patch Cords: Factory-made, unshielded, slim line, four-pair, type CMR cables in 48-inch (1200-mm) lengths; terminated with eight-position modular plug at each end.

1. Constructed using modular plugs with 50µm gold-plated contacts, and wired to the T568B wiring pattern.
2. Provide all-in-one, "snagless" plug/boot design for connections to patch panels with minimum interjack distance.
 - a. Boots that are wider than front width dimension are not acceptable.
 - b. Slip over jackets will not be allowed.
3. Cable assemblies may be AMP NETCONNECT part number 1933116-X, 1933117-X, 1933118-X, 1933119-X, 1933120-X, 1933121-X, 1933122-X, 933123-X, 1933124-X (X denotes length). or approved equal.

2.5 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: modular as called for in article "UTP Cable Hardware."
- B. Workstation Outlets: Two (or indicated number on the drawings when acting as Consolidation Points)-port-connector assemblies mounted in single or multigang faceplate.
- C. Faceplates shall be constructed utilizing single gang, staggered 4- or 6-port; or double gang, 6- or 12-port faceplates.

1. Accommodate self-adhesive labels and icon holes.
 2. With "leveling" screw holes which allow the faceplate to be adjusted for better placement over outlet boxes.
 3. Plastic Faceplate: High-impact plastic, white.
 4. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
 5. Legend: Snap-in, clear-label covers and machine-printed paper inserts.
- D. The 110 Connect faceplates may be AMP NETCONNECT part number(s) 83935-X, 83936-X, 557691-X, 558055-X or 558088-X where X denotes color.

2.6 IDENTIFICATION PRODUCTS

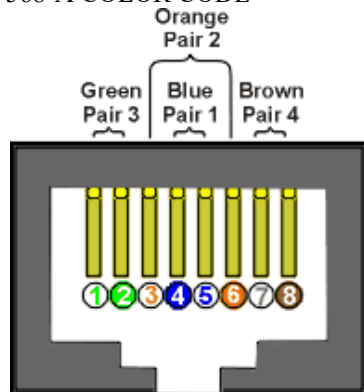
- A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. 110-Style Jacks: Terminate using EIA/TIA/ANSI 568A color designation wire connections.

568-A COLOR CODE



**RJ-45 JACK
EIA/TIA 568A STANDARD**

Pin 1	white/green
Pin2	green/white
Pin3	white/orange
Pin4	blue/white
Pin5	white/blue
Pin6	orange/white
Pin7	white/brown
Pin8	brown/white

- B. Horizontal Cabling, Typical: Install 2 cables to each data jack location, one for data and one for voice.
1. Locations with different requirements are shown on the drawings.

3.2 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
1. Comply with TIA/EIA-568-B.1.
 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 3. Install 110-style IDC termination hardware unless otherwise indicated.

4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels. Exceptions will be shown on drawings.
 5. Cables may not be spliced.
 6. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals. Longer support distances may be allowed in other areas of this contract.
 7. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 8. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.
 9. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 10. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 11. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
 12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
1. Comply with TIA/EIA-568-B.2.
 2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- D. Open-Cable Installation In Telecommunications Spaces:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
 3. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).
 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).
 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.

- b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
- c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).
- 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
- 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.3 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 - 1. Administration Class: 1.
 - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- C. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
- D. Cable and Wire Identification:
 - 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 - 4. Label each terminal strip and screw terminal in each outlet/jack, cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- E. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
 - 1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.

3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
4. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
5. UTP Performance Tests:
 - a. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2 for Category 6 compliance:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.
- C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 271500
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 311000 - CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This work shall consist of clearing, grubbing, trimming, removing, and disposing of or treatment of timber, construction slash, and debris. This work shall also include preservation of vegetation and objects designated to remain from injury or defacement.

1.2 RELATED SECTIONS

- A. Section 024100 "Waste Material Disposal."

1.3 DEFINITIONS

- A. Areas to be Cleared and Grubbed - The limits of clearing and grubbing will be established by this specification, by other specification items, or on contract Drawings. The clearing and grubbing limits will normally coincide with the designated working limits; however, the Contracting Officer may also designate individual trees and snags outside the clearing limits for selective removal and disposal, or he may designate areas within the working limits where clearing and grubbing is not required or allowed within the provisions of this specification.
 - 1. Grading Limits - Area that is to be excavated or covered with additional materials during construction.
 - 2. Working Limits - Area consisting of the grading limits plus room for equipment to maneuver to perform the necessary clearing and grubbing. These limits, to be held to a minimum, will be designated for each project.
 - 3. Clearing Limits - Area consisting of the working limits plus any additional area to operate a boom or other above-ground clearance requirement.

1.4 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this section. Payment will be included in the contract unit price for items shown in the schedule of items.

1.5 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

- A. All trees, brush, shrubs, stumps, roots, and other vegetative material and debris within the designated clearing limits, shall be cleared, grubbed, removed, and disposed of except the following condition:
 - 1. Those items designated to remain by the Contract or Contracting Officer.
 - 2. Undisturbed stumps outside the roadway and parking area, provided they do not extend more than 12 inches above the original ground (measured from the uphill side) and are not closer than 2 feet from the edge of road or parking area, are not in the cut or fill slopes, and they do not interfere with the placement or compaction of embankments.

- B. Topsoil Stripping: Soils heavy in organic materials (topsoil) shall be stripped to mineral soil prior to placement of any fill material. Stripped material shall be stockpiled on site and placed on disturbed areas upon completion of grading operations. Excess stripped material shall be disposed of in accordance with Section 024100 "Waste Material Disposal".
- C. All roots over 3 inches in diameter within the roadbed area shall be grubbed to a minimum depth of 6 inches below subgrade. Roots over 3 inches in diameter protruding from the excavated slope shall be cut flush with the excavated slope surface.

3.2 CLEARING OR CLEARING AND GRUBBING REQUIREMENTS FOR VARIOUS ITEMS:

- A. Sidewalks - The path and trail clearing limits shall be 5 feet on each side of the tread centerline and extend to a height of 8 feet above the tread. Shrubs normally growing less than 2 feet tall when mature shall be left undisturbed where they occur outside the cut and fill slope areas. All branches, except short shrubs, which extend into the travel way shall be removed by cutting them flush with the trunk of the tree or shrub.
- B. Roadways and Parking Areas - On roadways and parking areas, the area to be grubbed shall be an area between the cut and/or fill stakes. The clearing area will normally be an additional 5 feet on each side of the grubbed area and shall extend to a height of 14 feet above the finished roadway surface.
- C. Trenches for Water, Sewer, Electrical Lines, and other Underground Utilities - If no reference is made elsewhere, a clearing of 10 feet on each side of centerline will be allowed.
- D. Buildings - Construction work shall disturb a minimum of the existing terrain and plant life adjacent to the building site. Only trees, shrubs, stumps, and major roots which interfere may be removed. When excavation reveals the major roots of a live and significant tree nearby, the Contractor shall not remove the tree unless it interferes with the construction and removal is authorized by Contracting Officer.
 - 1. Offices - Maximum clearing limits shall be confined to the grading area shown on the Drawings.
 - 2. Concrete Pads- Maximum clearing limits shall be confined to an area 5 feet outside the exterior sides of the completed pad three sides. On the fourth side, sufficient space will be allowed to properly perform the work with equipment of sufficient size to do the work. Normally, the limits will be as indicated on the Drawings. Construction work shall disturb a minimum of the existing terrain and plant life adjacent to the site work. Branches of trees extending over the cleared area shall be trimmed to give a clear height of 12 feet above the cleared areas.

3.3 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Temporary erosion and sediment control shall be installed in accordance with Section 023701 "Sedimentation and Erosion Control".

3.4 WASTE DISPOSAL

- A. Debris and refuse shall be disposed of in accordance with Section 024100 "Waste Material Disposal".
- B. Building wastes shall be done in accordance with 017419 "Construction Waste Management and Disposal".

END OF SECTION 311000

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, group area pads, paths and tent pads.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Excavating and backfilling for utility trenches.
 - 4. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

1.2 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
- B. Borrow or Select Borrow: Satisfactory soil material used for embankment, backfill, or fill construction that is either imported from a commercial site or excavated from designated locations at the site.
- C. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Contracting Officer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet (3m) in width and pits more than 30 feet (9m) in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction of the Contracting Officer. Unauthorized excavation, as well as remedial work directed by Contracting Officer, shall be without additional compensation.
 - 4. Unclassified Excavation: Excavation to subgrade elevation and to lines and dimensions indicated regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
- D. Fill: Soil materials used to raise existing grades.
- E. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- F. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, aggregate base, drainage fill, initial or subsequent backfill, or topsoil materials.
- G. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building.

1.3 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Government or others unless permitted in writing by Contracting Officer and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Contracting Officer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Contracting Officer's written permission.
 - 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.4 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS, GENERAL

- A. Excavated material may be processed and used for backfill if the Contractor can show compliance with the material specified herein to the satisfaction of the Contracting Officer. If excavated material is not sufficient to meet requirements, Contractor shall import needed material.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.
 - 1. Remove rocks over 8 inches in maximum dimension, ice or frozen earth, muck, debris, and earth with high void content.
 - 2. Remove rocks over 3 inches in maximum dimension for backfill placed within 12 inches of vaults and holding tanks.

2.2 BACKFILL MATERIALS, UTILITY TRENCHES

- A. Pipe Zone Material
 - 1. Backfill material for electrical cable and all types of pipe, except ductile iron pipe and galvanized steel pipe, shall consist of soil, sand, or fine granular material free of $\frac{3}{4}$ inch or larger stones, and free of organic material. Pipe Zone material shall be imported from an approved commercial source. Pipe Zone material shall be paid for as such.
 - 2. Backfill material for all ductile iron or galvanized steel pipe shall consist of soil, sand, or rock smaller than two inches in largest dimension and free of organic material.
 - 3. Frozen material will not be allowed.
- B. Above-Pipe-Zone Material
 - 1. Backfill material shall be free from brush, perishable material, trash, rocks, or boulders larger than 6 inches in greatest dimension, or frozen material.
 - 2. Backfill material shall be trench-excavated material whenever it meets specification requirements. Whenever trench excavated material contains less than 10 percent of oversized material, the Contractor will be required to remove rocks larger than 6 inches from the trench excavated material at no additional compensation and utilize it as backfill material. If, after all suitable trench excavated material has been used as backfill, the trench is not filled to the required grade, the Contractor shall delay his backfill operations until the Contracting Officer can obtain profile elevations of the top of the partially filled trench. These elevations shall be used in computing the cubic yards for which payment will be made for imported material. Whenever material meeting the specification requirements for backfill above the pipe zone is not available from trench excavation, the Contractor will be required to import material from a designated or approved source. Imported above-pipe-zone material shall be paid for as such.
- C. Special Bedding – Imported
 - 1. Special bedding material shall consist of rounded river gravel or crushed, free-draining material, meeting the following gradation, as determined by ASTM C 136 and ASTM C 117.

SPECIAL BEDDING GRADATION	
Sieve Designation Square Openings	Percentage by Weight Passing Sieve
1"	100
3/4"	90 – 100
1/2"	20 – 55
3/8"	0 – 15
No. 4	0 - 5

2.3 ENGINEERED FILL

- A. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1 1/2 inch sieve and not more than 12 percent passing a No. 200 sieve.

2.4 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
- B. Tracer Wire: #14 copper wire, covered.

PART 3 - EXECUTION

3.1 LOCATION, ALIGNMENT AND GRADE

- A. The location of all structures shall be staked out and grades established by the Contractor. Locations shall be approved by the Contracting Officer before excavation is started.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

3.3 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.4 EXPLOSIVES

- A. Do not use explosives.

3.5 EXCAVATION SUPPORT AND PROTECTION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation.
- B. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and resisting soil and hydrostatic pressures and superimposed and construction loads.
- C. The Contractor shall meet State General Safety Orders and the provisions of the Occupational Safety and Health Administration (OSHA) pertaining to excavation support and protection, including 29 CFR 1926 Subpart P.
- D. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

3.6 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
- B. Topsoil shall be removed from the area to be excavated and from the area where excavated material will be piled, prior to excavation. Topsoil shall be stored as specified below.
- C. Maintain the excavations to guard against and prevent injury to employees and the public. Provide adequate shoring and bracing as required by OSHA and other local governing regulations.
- D. Excavations left open at the end of the working day shall be fenced to protect the public.

3.7 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Underground Tanks, Basins, Pump Houses and Utility Boxes: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.8 EXCAVATION FOR UTILITY TRENCHES

- A. All trench excavation shall conform, as near as possible, to the lines and grades illustrated on the drawings.
- B. Classification of Excavation Material - Excavation will be unclassified as to materials and shall include all materials which are encountered in the required excavation. Any information that has been obtained by the USDA Forest Service concerning possible ground conditions is available at the Supervisor's Office for the Forest where the project is located to interested parties upon request.
- C. Unsatisfactory Material - During excavation, if material which does not meet the backfill requirements of Article 2 (such as structurally unstable material, solid rock, over-sized rock, angular or sharp rock), as determined by the Contracting Officer, is encountered at the grade line for the pipe or cable, the unsatisfactory material shall be removed to a minimum depth of 6 inches below the utility line. Trenching shall be performed by any acceptable method, as permitted by the Contract General Provisions. In addition

to the General Provisions, the Contractor shall provide skilled blasting operators and precautions shall be taken to avoid damage to adjacent property.

- D. Trenching by Machine or by Hand - The use of trench digging machines will be permitted except in places where machines may cause damage to existing structures, utilities, or trees, in which case hand methods shall be employed. Areas specifically to be trenched by hand will be as indicated on the drawings and paid for separately. Machines shall be of the proper size to operate within the specified working limits. In areas being excavated by machine, any hand digging necessary to locate or cross utilities will not be paid for as hand trenching.
- E. Depth - Trench excavation shall provide a uniform (for all utilities) or gently changing (for all utilities except gravity flow sewer lines) flow line.
- F. Width of Trenches - The bottom width that will be used in arriving at pay quantities that are paid on the basis of volume shall be the design bottom width, as shown on the Schedule of Items, or as shown on the trench cross-section detail on the drawings. The width of trench allowed when computing excavation and/or backfill quantities shall be vertical lines for trenches less than 4 feet and for trenches greater than 4 feet shall be computed on 1/2 to 1 side slopes. In circumstances where trench sides will not stand or are not considered safe when sloped at 1/2 to 1, a slope will be determined in the field by the Contracting Officer for which pay quantities will be computed, and the slopes shall be laid back to the stable slope determined.
- G. The Contractor may excavate the trench narrower or wider than the design width shown on the drawings; however, the design width of the trench will be used to calculate the number of cubic yards of all excavated volume and volume of imported material that is paid for by unit volume.
- H. Any over excavation (width) performed by the Contractor for his convenience shall be at his own expense.
- I. Alignment and Grade - The location of all pipelines and structures will be staked out and grades established by the Contracting Officer before excavation is started. All trenches shall conform with the lines and grades illustrated on the drawings or staked on the ground. The Contractor shall set batter boards and shall establish grade lines and levels necessary for the work from dimensions and elevations shown on the drawings and as established in the field. Any shifting or change from the indicated alignment and grade must receive prior approval by the Contracting Officer in writing. Alignment and grade shall also meet the requirements of Sections governing the utilities which are being installed in the trench.

3.9 APPROVAL OF SUBGRADE

- A. Notify Contracting Officer when excavations have reached required subgrade.
- B. If Contracting Officer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof roll subgrade below the building slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Contracting Officer.

3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Contracting Officer.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Contracting Officer.

3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile, borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
- B. Topsoil shall be kept separate from trench-excavated material by either stockpiling or by windrowing on the opposite side of the trench from which the trench excavated material will be placed. Topsoil will be reused after backfilling on those areas from which it came.

3.12 STRUCTURE BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Inspecting and testing underground utilities and storage tanks.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place and compact fills and backfills adjacent to structures in such a manner as to prevent wedging action or eccentric lodging upon or against the structures.
- C. Place backfill in horizontal layers not more than 12 inches thick with proper moisture content for the required degree of compaction. Flooding or puddling is not allowed. Compact each layer as specified. Backfill layers under concrete flatwork shall be not more than 6 inches thick
- D. Do not place backfill against any concrete footings or structure without prior permission of the Contracting Officer and in no case less than 7 days after placement of concrete.
- E. Heavy equipment shall not be operated within four feet of any structure.
- F. Provide for anticipated settlement and shrinkage of the backfill and for the finished grades required.

3.13 UTILITY TRENCH BACKFILL

- A. Backfilling will be permitted only after all inspections of piping and/or cable have been performed and tests completed and the work to be covered has been approved by the Contracting Officer. Backfill which has been improperly placed and/or compacted shall be corrected, if directed by the Contracting Officer, by reopening the trench to the depth required to obtain proper compaction. Then the trench shall be refilled and compacted according to specifications.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.
- C. Backfill at Pipe Zone
 1. Any backfill in trench bottom where over excavation was performed by the Contractor for his convenience, shall be brought back to the pipe grade indicated at his own expense. If the trench bottom is prepared in wet conditions, special bedding conforming to Article 2 shall be used if determined necessary by the Contracting Officer.
 2. The bottom of trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe along its entire length, except for portions of the pipe sections where it is necessary to excavate for pipe joints. Depressions for joints shall be made in accordance with the recommendations of the manufacturers for the particular joint used. The bedding shall be a minimum of 4 inches in depth under the pipe and be of either special bedding or pipe zone material as conditions dictate. Trench bottom preparation shall be such that when final placement of pipe has been made, pipe will be true to line and grade. All adjustment to line and grade shall be made by scraping away or filling in with pipe zone material or special bedding material, as conditions dictate, under the body of the pipe and not by wedging or blocking.
 3. After pipe is placed as called for in applicable Sections governing the utilities being placed in the trench, pipe zone material shall be deposited in the trench uniformly on both sides of the pipe for

the full width of the trench in 6-inch horizontal layers (loose measurement) and compacted from the bottom of the trench to a depth of 1 foot over the top of the pipe.

4. An exception to this is on water lines and sewer lines where the Contractor elects to hydrostatically pressure test the pipe. Joints, couplings, fittings, and valves shall then be left uncovered until after the pipe has been tested. After testing proves the pipe installation to be satisfactory, pipe zone material shall then be placed carefully and compacted around the joints, couplings, fittings, and valves to a depth of 1 foot above the pipe, after which the remainder of the trench shall be backfilled. On gravity flow sewer lines, the Contractor may elect to pressure test the pipe with air. In this case, the entire trench is to be properly backfilled prior to the acceptance test.
5. Where electrical conduit is buried in the same trench as the waterline or sewer line, the backfill procedure for the conduit shall be performed as outlined in the preceding paragraphs. Location with respect to other utilities in a trench shall be as indicated on the trench cross-section detail as shown on the drawings.
6. When an electrical conduit is buried singly in a trench, or if only conduit is buried in a trench, the bedding shall be a minimum of 2 inches in depth under the conduit. After the conduit is placed, pipe zone material shall be deposited in the trench uniformly for the full width of the trench and compacted from the bottom of the trench to a depth of 4 inches over the top of the conduit.
7. Compaction and Testing: All compaction within the pipe zone (electrical conduit area is considered as pipe zone), shall meet the following: Material shall be compacted to not less than 95 percent of the maximum dry unit weight, as determined by AASHTO T180, Method D, or ASTM D 698, Method D. Ascertain adequate compaction during the backfill operation by performing in-place density tests in accordance with one or more of the following standard test procedures: ASTM D 1556, D 2167, or D 2922, or AASHTO T 191, or T 310.

D. Backfill Above-Pipe-Zone

1. When shown on the drawings as being required, marking tape shall be installed eight inches below the ground surface and shall run the full length of the trenches.
2. Backfill in trenches in areas other than under roadways and parking areas shall be placed in horizontal layers 12 inches thick or less (loose measurement). Layers shall be compacted before the succeeding lift is placed with at least three passes of an approved mechanical compaction device.
3. Compaction and Testing: Backfill in trenches under roadways and parking areas shall be maintained, wetted, or dried to optimum moisture for maximum compaction, placed in the trench in horizontal layers not to exceed 6 inches in thickness (loose measurement), and compacted to not less than 95 percent of maximum dry unit weight, as determined by AASHTO T180, Method D, or ASTM D 698, Method D. Ascertain adequate compaction during the backfill operation by performing in-place density tests in accordance with one or more of the following standard test procedures: ASTM D 1556, D 2167, or D 2922, or AASHTO T 191, or T 310.

E. Special Bedding – Imported

1. Special bedding shall be placed, as directed by the Contracting Officer, in trenches, as necessary, to provide a minimum of 4 inches firm bedding on which to set the pipe in areas where relatively unstable conditions exist, due to seeping ground water or mud caused by ground water, or by water from any other source which cannot be diverted. After the material is placed in the trench, leveled, and consolidated, it shall be trimmed to proper sub grade and shaped to receive the pipe.
2. The Contractor shall construct restrictive sections (dams) in the special bedding material at least every 200 feet to minimize the possibility of excessive ground water flows undercutting the pipe. The dam shall extend across the entire width of the trench, be a minimum of 3 feet long, and shall extend to the top of the pipe zone material.

F. Imported Material

1. Any trench excavated material that can be transported less than 300 feet to other areas along the trench and used, in accordance with specifications, shall not be considered as imported material. When the Contractor is required to import material, it shall be from a designated or approved source.

G. Trenches in Embankments

1. When pipelines are to be placed in trenches excavated in embankments, the excavation of each trench shall be performed after the embankment has been constructed to an elevation at least 3 feet over the pipe or to finish grade, whichever is least.

H. Surface Restoration in Areas Other Than Roads

1. All surfaces shall be restored to the required grade (usually original ground line), mounded over or smoothed off as directed, and left in a uniform and neat condition, to the satisfaction of the Contracting Officer. Surface drainage shall be diverted so that it will not flow along a trench. In areas where natural revegetation is designated (no planting to be done), the Contractor shall scarify all disturbed or compacted areas and right-of-ways such that the surface of the ground is loose to a depth of at least one inch. In areas to be seeded, the area shall be prepared in accordance with Section 329206 "Seeding."

I. Warning Tape and Tracer Wire:

1. Warning Tape: Install directly above utilities, as shown on the Drawings.
2. Tracer Wire: Wrap all buried, non-metallic, nonperforated piping with tracer wire.
 - a. Conductivity Testing: Conductivity to be tested before and maintained while backfilling trench. After backfilling, the contractor shall perform a continuity test to the satisfaction of the Contracting Officer.
 - b. Access: Extend tracer wire at least 12-inches above grade at junctions, valves, hydrants and ends of new lines. Attach tracer wire to object or structure where possible. Fold or wrap remaining wire so it is accessible to owner, but not generally visible to the public.

3.14 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:
 1. Under grass and planted areas, use satisfactory soil material.
 2. Under paths, slabs on grade and family units/group areas, use satisfactory soil material.
 3. Under building slabs, use engineered fill.
 4. Under septic and holding tanks, use engineered fill.

3.15 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF BACKFILLS, FILLS AND SUBGRADES

- A. The minimum degree of compaction required shall be a percent of the maximum laboratory density obtained by the standard proctor test AASHTO T180 or ASTM D698. The in-place field density shall be determined by AASHTO T310 or ASTM D2922. The minimum compaction requirements are:
 1. For Utility Trenches, see "Utility Trench Backfill" article above.
 2. Under structures, water and septic tanks, utility boxes, building slabs, concrete slabs on grade, scarify and re-compact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent.
 3. Under paths and aggregate surface pads, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill with three passes of an approved vibratory plate compactor.

4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 2. Paths or Pads: Plus or minus 1 inch.
 3. Slabs on Grade: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.
- D. Finishing Slopes: Finished slopes shall conform reasonably to the lines staked on the ground or shown on the drawings. The finished slope shall be left in a roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and stringline or hand-raking methods will not be allowed.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.
- C. Testing agency will test compaction of soils in place according to AASHTO T310. Tests will be performed at the following locations and frequencies:
 1. Minimum testing requirements are listed in Table 014100 of Specification Section 014100 "Quality Control" and as listed herein.
 2. Moisture-Density Relationship: One test for each soil type encountered.
 3. Utility Lines:
 - a. Pipe Zone Material: One test per 200 linear feet of trench at locations designated by the Contracting Officer.
 - b. Above Pipe Zone Material: One test per 200 linear feet of trench at locations designated by the Contracting Officer.
- D. When testing agency reports that subgrades, fills or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.
- E. Excessive settlement or other evidence of improper backfill shall be corrected by reopening the trench or excavation to the depth required for proper compaction and then shall be refilled and satisfactorily compacted.
- F. The correction and retesting of unacceptable work shall be paid by the Contractor at no expense to the Government.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing and erosion. Keep free of trash and debris.

- B. Repair and reestablish grades to specify tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Contracting Officer, reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.20 SURFACE FINISH

- A. In unpaved areas all surfaces shall be restored to the original ground line or elevations shown on the drawings and left in a uniform and neat condition. Any stockpiled topsoil shall be smoothly distributed over disturbed areas to elevations shown on the drawings.
- B. In paved areas, apply surface treatment as specified and shown on the drawings.

3.21 CLEANUP

- A. After backfilling and grading has been completed, the disturbed area shall be finished to present as near a natural appearance as possible and cleaned up by removing all debris and materials not utilized. Cleanup shall include disposal of waste materials in accordance with Section 024100 "Waste Material Disposal." Stockpiled topsoil shall be smoothly distributed over disturbed areas and hand raked to blend with ground line.

END OF SECTION 312000
OCTOBER 2012

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 312010 - SELECT BORROW

PART 1 - GENERAL

- 1.1 This item shall consist of excavating, hauling, and satisfactorily placing approved material from an approved source in accordance with these specifications and in conformity with the lines and grades established.
- 1.2 Select borrow shall be placed as directed within the improvement or area to construct the roadbed or embankments, parking spurs, parking areas, approach roads, paths, and boat ramps, etc., or as subgrade reinforcement.
- 1.3 METHOD OF MEASUREMENT
 - A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.
- 1.4 RELATED WORK
 - A. The work shall be in accordance with the following subsidiary specifications. The subsidiary specifications are referred to in the text by the Section designation only.
 - 1. Section 312100 "Project Site Preparation and Grading."

PART 2 - PRODUCTS

- 2.1 GENERAL
 - A. Select borrow shall be selected from the designated borrow source and approved by the Contracting Officer as meeting the requirements for which the material was intended. Granular materials shall be reasonably well graded.
- 2.2 GRADATION
 - A. General select borrow shall contain not more than 20 percent material capable of passing a 200 sieve and shall not contain rock larger than 6 inches in greatest dimension. However, where select borrow is to be used in fills 0 - 5 inches thick, the maximum allowable size of rock particles shall be less than 6 inches in greatest dimension in order to be compatible with the depth of fill. In any case, the select borrow shall contain not more than 40 percent rock particles larger than 4 inches in greatest dimension.
- 2.3 SOURCE
 - A. Select borrow shall be obtained from a commercial source.

PART 3 - EXECUTION

- 3.1 PLACING MATERIAL
 - A. All placement and compaction shall be in accordance with Section 312100.
- 3.2 PROCESSING
 - A. When the select borrow is a granular material used as subgrade reinforcement, the Contractor shall use necessary precautions in loading and spreading the material to assure reasonable uniformity in grading. The material as placed shall be processed to provide a uniform mixture.
- 3.3 CLEARING, OVERBURDEN AND CLEANUP

- A. Prior to beginning a borrow excavation, all necessary clearing and grubbing on the area shall be performed and refuse properly disposed of.
- B. Unsuitable or other spoils or overburden material shall be removed and deposited clear of the work.
- C. After a select borrow excavation has been completed, the side slopes shall be flattened and the general area smoothed up, including the haul road. Grade area to drain surface water away from the borrow source. Cleanup will include roughly grading the overburden, unsuitable material and spoils material over the area. Cleanup shall be done as directed and the area left suitable for reseeding.

END OF SECTION 312010
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 312100 - PROJECT SITE PREPARATION AND GRADING

PART 1 - GENERAL

1.1 This Section includes the following:

- A. Clearing, grubbing, sediment and erosion control measures, road obliteration, shaping, compacting, excavating, and/or filling to the established sub grade as shown on the drawings, details and as staked. Such items covered include, but are not limited to construction of subgrade for roads, parking areas, campground spurs, pathways, concrete slabs, subsurface drainage structures, and grading around constructed features.
- B. This section also includes the disposal of waste materials generated.

1.2 RELATED SECTIONS:

- A. The following Sections contain requirements that relate to this Section:
 - 1. Section 023701 "Sediment and Erosion Control Measures."
 - 2. Section 024100 "Waste Material Disposal" for the loading, handling, hauling, and placing of excess excavation material, and unsuitable excavation material.
 - 3. Section 311000 "Clearing and Grubbing" for site clearing, grubbing, trimming, disposing of or treatment of timber, slash, and construction debris, and for protection of existing trees and plantings.
 - 4. Section 312000 "Earthwork" for preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings, and for excavating and backfilling for buildings, structures, utility trenches, and buried mechanical and electrical utilities.
 - 5. Section 312010 "Select Borrow" for excavating, hauling, and placing approved material from an approved source to construct roadbeds, embankments, parking areas, approach roads, paths and boat ramps, or as subgrade reinforcement.
 - 6. Section 312225 "Excavation and Embankment" for construction of roads, parking areas, spurs, pathways, and drainage features.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
 - 1. Standard Moisture Density Test, AASHTO T-99, Method C or D.
 - 2. Density of Soil In-Place by the Sand-Cone Method, AASHTO T191
 - 3. Density of Soil In-Place by the Drive Cylinder Method, AASHTO T204
 - 4. Density of Soil In-Place by the Rubber-Balloon Method, AASHTO T205
 - 5. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)), ASTM D698
 - 6. Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method, ASTM D1556
 - 7. Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method, ASTM D2167
 - 8. Standard Classification of Industrial Fluid Lubricants by Viscosity System, ASTM D2422

1.4 METHOD OF MEASUREMENT AND PAYMENT:

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

- 2.1 Select Borrow for construction of road and parking area shall consist of approved material from the designated borrow area shown on the drawings and in accordance with Section 312010 "Select Borrow".

PART 3 - EXECUTION

3.1 PREPARATION

- A. Stripping Sod and Other Organic Materials: Sod, pine needles, and soil heavy in organic materials (topsoil) shall be stripped to mineral soil prior to any excavation or placement of fill material. Stripped material shall be stockpiled on site and placed on disturbed areas upon completion of grading operations. Excess stripped material shall be disposed of in accordance with Section 024100 "Waste Material Disposal".
- B. Clearing and Grubbing
1. All clearing and grubbing shall be performed in advance of beginning excavation and grading operations in accordance with Section 311000 "Clearing and Grubbing".
 2. Care shall also be taken to protect and preserve trees and plantings not marked for removal.
 3. During all phases of construction the contractor shall confine all of his operations within the working limits as defined in Section 311000 "Clearing and Grubbing".
- C. Sediment and Erosion Control Measures: All sediment and erosion control measures shall be placed prior to any ground disturbance in accordance with Section 023701 "Sediment and Erosion Control Measures."

3.2 GRADING

- A. Graded areas shall be constructed of shallow cuts and fills using native excavated soil and/or select borrow. Some light excavation shall be performed to remove protruding boulders and surface irregularities and at other locations as staked by the Contracting Officer.

3.3 EARTHWORK

- A. Shall be completed in accordance with Section 312000 "Earthwork" for the construction of subgrades for slabs-on-grade, family unit and group area pads, sidewalks, plantings, and for excavating and backfilling for buildings, structures, utility trenches, and buried mechanical and electrical utilities.
- B. Shall be completed in accordance with Section 312225 "Excavation and Embankment" for construction of Roads, Parking Areas, Asphalt Paths, Campground Spurs, and Drainage Features.

3.4 CLEANUP

- A. The Contractor shall confine his operation to that area within the staked fill or cut line of existing roadways, parking areas, paths, etc. No equipment shall be moved over, operated from, or be parked outside this staked fill or cut line, clearing limit, or existing roadway. No materials shall be moved over, stored, or obtained from outside the staked cut or fill lines except by written permission of the Contracting Officer. No rocks, stumps, limbs, debris, soil, or other material shall be left as a windrow or accumulation along the toe of fills, top of cuts, or adjacent areas.

END OF SECTION 312100
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 312225 - EXCAVATION & EMBANKMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This work consists of excavating material and constructing embankments. This work includes furnishing, hauling, stockpiling, placing, disposing, sloping, shaping, compacting, and finishing earthen and rocky material; drainage excavation; removal of slide material; and excavation and disposal of unsuitable material.

1.2 DEFINITION

- A. Excavation - All material excavated from within the right-of-way or easement areas that is not included under other pay items listed in the Schedule of Items. Roadway excavation includes all material encountered regardless of its nature or characteristics.
- B. Borrow or Select Borrow - Material used for embankment construction that is obtained from outside the roadway prism from sources shown on the Drawings. Additional sources of borrow excavation will be subject to approval in advance by the Contracting Officer.
- C. Embankment Construction. Embankment construction consists of placing and compacting roadway or borrow excavation. This work includes:
 - 1. Preparing foundation for embankment;
 - 2. Constructing roadway embankments;
 - 3. Benching for side-hill embankments;
 - 4. Constructing dikes, ramps, mounds, and berms, and
 - 5. Backfilling subexcavated areas, holes, pits, and other depressions.
- D. Suitable Material - Granular material conforming to ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 24 inches in any dimension, debris, waste frozen materials, vegetation, and other deleterious matter.
- E. Unsuitable Material - ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1.3 SUBMITTALS AND QUALITY CONTROL

- A. Density Tests results in "Embankment Placing Methods" paragraph in Part 3.
- B. Testing frequency shall be as indicated below. Repeat tests shall be conducted in any areas where test results indicate noncompliance with specification requirements. All tests shall be conducted under the direction of a registered engineer or certified testing laboratory.

Type of Test	Frequency
Moisture-Density Relationship	1 for each soil type encountered
Density of Soil In-Place	1 for each 1000 square feet of subgrade with a minimum of 2 per building

1.4 MEASUREMENT AND PAYMENT

- 1. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.1 CLEARING & GRUBBING

- A. Clearing and Grubbing shall be completed in accordance with specification Section 311000 "Clearing and Grubbing".
- B. Clearing and grubbing shall be accomplished before excavation or embankment placement begins. Pioneering of roads, slash disposal, and grubbing of stumps may proceed concurrently with clearing and grubbing operation when approved by the Contracting Officer. Excavation and placement operations shall be conducted so slash material to be treated will not be incorporated in the roadway.

3.2 ROADWAY EXCAVATION AND EMBANKMENT SURFACE PREPARATION

- A. General: Do not disturb material and vegetation outside the construction limits. Incorporate only suitable material into embankments. At the end of each day's operations, shape to drain and compact the work area to a uniform cross-section. Eliminate all ruts and low spots that could hold water.
- B. Rock Cuts: Excavate rock cuts to 6 inches below subgrade within the roadbed limits. Backfill to subgrade with suitable material.
- C. Earth Cuts: Scarify earth cuts to 6 inches below subgrade within the roadbed limits.
- D. Embankments Surface Preparation: Remove topsoil and break up the ground surface to a minimum of 6 inches by plowing or scarifying.
- E. All material shall be compacted according to "Embankment Placing Methods" paragraph in Part 3.

3.3 UTILIZATION OF EXCAVATED MATERIALS

- A. All suitable, excavated material shall be used in the construction of embankments, subgrades, shoulders, slopes, bedding, and backfill for structures and for other purposes as shown on the Drawings.
 - 1. Excess Excavation:
 - a. Designed excess excavation shall be disposed of as shown on the Drawings.
 - 2. Conserving Material:
 - a. Material encountered in the excavation, suitable for cushion, road finishing, or other purposes, may be conserved and utilized instead of materials from **COMMERCIAL PIT DESIGNATED** sources. Excessively wet material that is otherwise suitable for embankment shall be field drained and dried before placement.
 - 3. Excavation of Unsuitable Material:
 - a. Unsuitable material shall be excavated and disposed of as shown on the Drawings or on site as directed by the Contracting Officer (CO). Excavated areas shall be backfilled with suitable material when necessary to complete the work. Frozen material shall not be placed in embankments. Rocks that are too large to be incorporated into the embankment shall be broken for incorporation into the embankment, maneuvered to the face of the embankment and embedded so that they will not roll or obstruct the use and
 - 4. Conservation of Topsoil:
 - a. When shown on the Drawings, suitable topsoil shall be removed, transported, and deposited in the DESIGNATED stockpile areas.

3.4 DRAINAGE EXCAVATION

- A. Drainage excavation shall include construction of side ditches, minor channel changes, inlet and outlet ditches, furrow ditches, ditches constructed along the road but beyond the roadway limits, and other minor earth drainage structures as shown on the Drawings. Excavated material shall be utilized in accordance with "Utilization of Excavated Materials" paragraph above.

3.5 FINISHING ROADBED

- A. For roads receiving aggregate base or surface course, only rocks that do not protrude above the subgrade more than one-third of the depth of the base or surface course, or 3 inches, whichever is less, may remain in place.
- B. For unsurfaced roads, unless otherwise shown on the Drawings, the top 4 inches below the finished road surface shall not contain rocks larger than 4 inches in greatest dimension. Oversize material shall be removed, reduced to acceptable size, or covered by importing suitable material approved by the Contracting Officer.
- C. The subgrade shall be visibly moist during shaping and dressing. Low sections, holes, cracks, or depressions shall be brought to grade with suitable material approved by the Contracting Officer. Final compaction of the subgrade shall meet the requirements of the embankment placing method specified.

3.6 SNOW REMOVAL

- A. Snow or ice shall not be incorporated in the embankment. Snow shall be removed in advance of the work and deposited beyond the roadway limits in a manner that will not cause resource damage or waste material.

3.7 FINISHING SLOPES

- A. Finished slopes shall conform reasonably to the lines staked on the ground or shown on the Drawings. The finished slope shall be left in a roughened condition to facilitate the establishment of vegetative growth. The finish associated with template and stringline or hand-raking methods will not be allowed. Loose rock, loose debris, and other loose material, each of which is larger than 6 inches in diameter, shall be removed from the slope unless otherwise shown on the Drawings.
- B. The tops of excavations, excluding areas of solid rock, shall be blended with the adjacent terrain by rounding where shown on the Drawings. Decomposed rock that may be cut without blasting or ripping shall be rounded. Earth overlying rock shall be rounded above the rock.
- C. All rock excavations that require blasting shall be formed with controlled blasting techniques unless otherwise shown on the Drawings. Controlled blasting is defined as the controlled usage of explosives and blasting accessories in appropriately aligned and spaced drill holes for the purpose of producing a free surface or shear plane in the rock excavation slopes and of minimizing landscape damage, adjacent ground vibration, and overbreak. Presplitting is not intended unless shown on the Drawings.
- D. Unless directed otherwise by the Contracting Officer, the contractor shall drill, blast, and excavate short test sections (not to yield in excess of 1,000 cubic yards) to determine the controlled blasting method, hole spacing, and charge best suited to the material encountered.

3.8 OVERBUILDING & LANDSCAPE & STREAM PROTECTION

- A. Unless otherwise agreed to by the Contracting Officer, excavation or embankment material shall be confined within the roadway limits to avoid overbuilding and to protect the landscape and streams.

3.9 SUBGRADE TREATMENTS

- A. Subgrade treatment shall consist of soil modification by admixing aggregates, placing geotextiles, fiber mat, wood corduroy, rock blanket, or other similar materials. The construction and material requirements for the type of subgrade treatment will be shown on the Drawings.

3.10 EARTH BERMS

- A. Permanent earth berms shall be constructed along the shoulder of the traveled way at locations shown on the Drawings. Material used in the construction of berms shall be well graded with no rocks having a dimension greater than one-fourth the height of the berm.
- B. Acceptable material for the berm may be windrowed as the roadbed is constructed. When the local material is not acceptable, material shall be imported from approved sources. Material used for berm construction

shall contain no frozen material, roots, sod, or other deleterious material. Material shall not be wasted over the embankment slope.

- C. Compaction shall be accomplished by operating the spreading equipment over the full section of the berm.

3.11 EMBANKMENT PLACING METHODS

- A. All Methods: When an embankment is to be placed across swampy ground and removal of unsuitable material or subgrade treatment is not required, the lower part of the embankment shall be constructed in a single layer to the minimum depth necessary to support construction equipment.
- B. Specific Methods: All embankments shall be placed by Method 4 unless otherwise noted.
1. Method 4. Controlled Compaction: Embankments shall be placed as specified in Method 2, except earth embankments shall be placed in horizontal layers not exceeding 12 inches (loose measure) and compacted. Material shall be at moisture content suitable for attaining the required compaction. Embankments and the top 1-foot of excavation sections shall be compacted to at least 95 percent of the maximum density as determined by AASHTO T 99, Method C or D.
 - a. The density of the embankment material will be determined during the progress of the work in accordance with AASHTO T 191, T 205 or T 238; T 217, T 239, or T 255. Corrections for coarse particles will be made in accordance with AASHTO T 99, Note 7.
 - b. Density requirements will not apply to portions of rock embankments that cannot be tested in accordance with approved methods. When this condition exists, compaction shall be provided by working smaller rocks and fines in with the larger rocks to fill the voids and by operating equipment over the embankment materials.

3.12 CONSTRUCTION TOLERANCES

- A. The tolerance class shall be "C" for roads, spurs and parking areas and "E" for all pathways. Roadway ditches shall be constructed to flow in the direction shown on the Drawings.
- B. Deviations shall be uniform in the direction of change for a distance of 200 feet or more along the project centerline.

TOLERANCE CLASS **

Item	A	B	C	D	E	F	G	H	I	J
Roadbed Width (Ft)	+0.5	+0.5	+1	+1	+1	+1	+1	+1.5	+1	+2
Subgrade Elevation (Ft)	±0.1	±0.2	±0.2	±0.5	±0.5	±1	±1	±1.5	±2	±3
Centerline Alignment (Ft)	0.2	0.2	0.5	0.5	1	1	1	1.5	2	3
Slopes, Excavation and Embankment (Percent Slope)*	±3	±5	±5	±5	±5	±5	±10	±10	±10	±10

**Maximum allowable deviation from construction stakes and drawings.

*Maximum allowable deviation from staked slope measured from slope stakes or hinge points.

END OF SECTION 312225

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 321200 - HOT-MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes hot-mix asphalt concrete pavement, patching and repair.
- B. Related Sections include the following:
 - 1. Section 321204 "Crushed Aggregate Base or Surface Coarse."

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Submit written job-mix formulas for approval at least 28 days before production. Furnish mixes of aggregate, asphalt binder, recycled asphalt pavement, and additives that meet the applicable gradation and material requirements in one of the following:
 - 1. Superpave designed asphalt mixture with performance grade asphalt binder **PG 58-28**.
 - 2. Hveem or Marshall designed asphalt mixture as approved by the Contracting Officer.
 - 3. State Department of Transportation approved asphalt concrete pavement mixture as approved by the Contracting Officer.
- C. Material certificates.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer shall be registered with and approved by the Department of Transportation of the state in which Project is located.
- B. Pre-paving Conference: Coordinate attendance with the Contracting Officer and all applicable subcontractors. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - 2. Review condition of subgrade and preparatory work.
 - 3. Review Traffic Control Plan
 - 4. Review Contractor Quality Control Plan for paving and testing.
 - 5. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - 6. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 7. Review acceptance procedures

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:
 - 1. Prime and Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

1.5 MEASUREMENT AND PAYMENT

- A. (Civil) Asphalt Parking Lot: Payment will be lump sum. Includes surface preparation, subgrade compaction, and installation of pavement. Repair and patching also includes cutting, tack coat and other necessary preparations.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or properly cured, crushed blast-furnace slag.
- C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, properly cured blast-furnace slag, or combinations thereof.
 - 1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes designed according to one of the following:
 - 1. Superpave Bituminous Concrete Wearing Surface Layer, Leveling, $\frac{3}{4}$ " Maximum Aggregate Size Mix, ESAL Range 3 to <30 as designed in FP-03, Section 401.
 - 2. Hveem or Marshall designed asphalt mixture class A, Grading B as designated in FP-03, Subsection 402.
 - 3. State Department of Transportation approved mix design. The mix design shall have a history of satisfactory performance in geographical area where project is located.
 - 4. Do not begin mix production until the job-mix formula is approved by the Contracting Officer.
- B. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes designed according to procedures in AI SP-2 "Superpave Mix Design", AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.", or State Department of Transportation approved mix design. The mix design shall have a history of satisfactory performance in geographical area where project is located. Do not begin mix production until the job-mix formula is approved by the Contracting Officer.

2.3 ROAD BASE

- A. Crushed Aggregate Base shall be according to Section 321204 "Crushed Aggregate Base or Surface Coarse."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.
- D. Saw Cutting of Adjacent Pavement –
 - 1. Make a vertical cut through the full depth of surface in a straight clean line.
 - 2. Where the edge of the existing surface is cracked, broken, or deteriorated, make the cut so the defective surface can be removed.
 - 3. Do not allow traffic or construction equipment to cross the cut edge.

4. Apply a tack coat (at a rate of 0.05 to 0.15 gal./sq.yd.) to the cut edge before placing hot mix asphalt surfacing.
5. Avoid smearing or staining adjoining surfaces.

3.2 MIXING

- A. Hot-Mix Asphalt Pavement Mix and Mixing Plant shall conform to AASHTO M156.

3.3 HAULING

- A. Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds that have been thinly coated with a material to prevent the mixture from adhering to the beds. Truck beds shall be drained prior to loading. Each truck shall have a cover to protect the mixture from the weather. When necessary to ensure that the mixture will be delivered at the specified temperature, truck beds shall be insulated and covers shall be securely fastened.

3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
 2. Spread mix at minimum temperature of 275 deg F.
- B. Pavers: Use pavers that are self-contained, power-propelled units with adjustable vibratory heated screeds, capable of spreading and finishing courses of asphalt mix in thicknesses and widths shown on the Drawings without segregating, tearing, shoving, or gouging. When indicated, pavers shall be equipped with automatic screed controls and with sensors capable of sensing grade from an outside reference line, sensing transverse slope of the screed, and providing the automatic signals that operate the screed to maintain grade and transverse slope.
- C. Thickness: The completed pavement shall have a minimum thickness of 4 inches after compaction or as shown on the Drawings

3.5 COMPACTING

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
- B. Thoroughly and uniformly compact the asphalt surface by rolling. Do not cause cracking, shoving, or undue displacement. Continue rolling until all roller marks are eliminated, all cracks are sealed, and the required density is obtained. Do not roll the mix after the surface cools below 175 ° F.
- C. Monitor the compaction process with nuclear density gauges. Compact to a pavement specific gravity (density) that is no less than **92 percent** of the maximum specific gravity (density) determined according to AASHTO T 209.

3.6 JOINTS, TRIMMING EDGES, AND CLEANUP

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat to joints.
 2. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
 3. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 4. Compact asphalt at joints to a density within 2 percent of specified course density.

- B. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- C. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- D. Disposal: Except for material indicated to be recycled, remove all trimmed or otherwise discarded materials from Project site and legally dispose of them in an EPA-approved landfill. Do not allow waste materials to accumulate on-site.

3.7 PAVEMENT SMOOTHNESS

- A. Use a 10-foot metal straight edge to measure at right angles and parallel to the centerline. Defective areas are surface deviations in excess of ¼ inch in 10 feet between any two contacts of the straightedge with the surface. Correct defective areas using approved methods.

3.8 PATCHING AND REPAIR

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to clean, vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Fill excavated pavements with hot-mix asphalt, while still hot, compact flush with adjacent surface.
- D. Thickness: The completed pavement shall have a minimum thickness of 4 inches after compaction or as shown on the Drawings.
- E. Acceptance: The compacted bituminous surfacing, when ready for acceptance, shall be thoroughly compacted, smooth, and match existing grade and cross section.

3.9 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Herbicide Treatment: When shown on the Drawings, apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.10 ACCEPTANCE

- A. Hot Asphalt Concrete Pavement shall be tested as indicated in Part 1 – “Quality Assurance.”
- B. Gradation and Asphalt Content
 - 1. Gradation: AASHTO T30

2. Asphalt Content: AASHTO T 308
 3. Frequency: 1/700 tons or a minimum of 3 per project
 4. The Contractor shall provide a split to the Contracting Officer when requested.
- C. Field density
1. Shall be determined in place after final rolling by nuclear method according to ASTM D 2950 or other approved procedure. The frequency of testing shall be once per 300 square yards or more frequently if needed to show compliance with the specifications. The test results shall be provided upon completion.
- D. Thickness
1. In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549. The frequency of testing shall be once per 300 square yards or more frequently if needed to show compliance with the specifications. Tests shall be performed after compaction. The test results shall be provided upon completion.
 2. Tolerance: Plus 1/4 inch, no minus.
- E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 321200

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USDA FOREST SERVICE, R4
 FLAMING GORGE RANGER DISTRICT ADDITION
 SECTION 321204 - CRUSHED AGGREGATE BASE OR SURFACE COURSE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes furnishing, hauling and placing one or more courses of aggregate base or surface course material on roadways, parking areas, concrete pads, sidewalks and pathways. In addition, may include furnishing, hauling, and placing crushed aggregate for bedding and backfill.

1.2 SUBMITTALS

- A. Aggregate source, gradation, and material properties.
 - 1. Submit target values within the gradation ranges shown in Table 321204-1 and /or 321204-2 for the required grading. After reviewing the Contractor's proposed target values the CO will determine the final values for the gradation and notify the Contractor in writing.
- B. Compaction density test results and proctor.

1.3 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Furnish aggregate Subbase, Base, or Surface Courses meeting the gradation ranges shown in Table 321204-1 and Table 321204-2. Aggregate grade selection shall be as shown on the Drawings and in the Schedule of Items.
- B. Materials shall be obtained from an approved source. Furnish aggregates that consist of hard, durable particles or fragments of crushed stone, crushed slag, or crushed gravel meeting the appropriate gradation and conforming to the following:
 - 1. Los Angeles abrasion, AASHTO T 96 40% max
 - 2. Sodium sulfate soundness loss (five cycles), AASHTO T 104 12% max
 - 3. Durability index, AASHTO T 210 35 min
 - 4. Fractured faces, ASTM D 5821 (Subbase or Base)..... 50% min
 - 5. Fractured faces, ASTM D 5821 (Surface Course)..... 75% min
 - 6. Free from organic matter and lumps or balls of clay.
- C. Obtain the aggregate gradation by crushing, screening, and blending processes as necessary.

2.2 AGGREGATE GRADATION

Table 321204-1, Crushed Aggregate Grading Requirements for Subbase and Base.

Percent Passing (AASHTO T27 and T11)					
Sieve	Grading A (Subbase)	Grading B (Subbase)	Grading C (Base)	Grading D (Base)	Grading E (Base)
2 1/2 -inch	100				
2-inch	97-100	100	100		
1-1/2-inch		97-100			
1-inch	65-79 (6)		80-100 (6)	100	

3/4-inch			60-94 (6)	86-100 (6)	100
1/2-inch	45-59 (7)				
3/8-inch			40-69 (6)	51-82 (6)	62-90 (6)
No. 4	28-42 (6)	40-60 (8)	31-54 (6)	36-64 (6)	36-74 (6)
No. 40	9-17 (4)			12-26 (4)	12-26 (4)
No. 200	4-8 (3)	4-12 (4)	4-7 (3)	4-7 (3)	4-7 (3)

() The value in the parentheses is the allowable deviation (+ / -) from the target values.
Liquid Limit, AASHTO T89 = 25 max. Plastic Limit, AASHTO T-90 = nonplastic.

Table 321204-2, Crushed Aggregate Grading Requirements for Surface Course.

Percent Passing (AASHTO T27 and T11)		
Sieve	Grading F (Surface Course)	Grading G (Surface Course)
1-1/2-inch	100	
1-inch	97-100	100
3/4-inch	76-89 (6)	97-100
1/2-inch		
3/8-inch	56-68 (6)	70-80 (6)
No. 4	43-53 (7)	51-63 (7)
No. 8		
No. 16	23-32 (6)	28-39 (6)
No. 40	15-23 (5)	19-27 (5)
No. 200	10-16 (4)	10-16 (4)

() The value in the parentheses is the allowable deviation (+ / -) from the target values.
Liquid Limit, AASHTO T 89 = 35 max, Plastic Index, AASHTO T90 = 2 to 9 if percent passing the No. 200 sieve is less than 12% and less than 2 if the percent passing the No. 200 sieve is greater than 12%.

If the plasticity index (PI) is greater than 0, the TV range for the No. 200 sieve size is 8-12 (4).

PART 3 - EXECUTION

3.1 GENERAL

- A. Verify that subgrade is dry and in suitable condition, locate areas that are unstable or that require further compaction.
- B. Proceed with aggregate placement only after unsatisfactory conditions have been corrected and subgrade is approved in writing by the Contracting Officer (CO).

3.2 PREPARATION OF SUBGRADE

- A. The subgrade shall be prepared in accordance with requirements of other specifications sections.
- B. The subgrade shall conform to the lines and grades shown on the Drawings. Suitable material shall be utilized in the preparation of the subgrade. When embankment or fill is necessary, subgrade shall be placed in compacted layers not exceeding 6 inches. Unless specified otherwise, subgrade shall be compacted to 95 percent of AASHTO T 99, method C or D.
- C. Suitable material for subgrade shall be granular material or fine compatible soil free of excess moisture, muck, frozen lumps, roots, sod, and other deleterious material. Remove all rock particles and hard earth clods larger than 3 inches in the longest dimension.

3.3 MIXING AND SPREADING

- A. Mix the aggregate and adjust the moisture content to obtain uniform moisture. Spread and shape the mixture on the prepared surface in a uniform layer not to exceed 6 inches in compacted thickness.
- B. Route hauling equipment uniformly over the full width of the surface to minimize rutting or uneven compaction.

3.4 COMPACTING

- A. Compact each layer of aggregate full width. Compact each layer to a density of at least 95 percent of the maximum density as determined by AASHTO T 99 method C or D.

3.5 SURFACE AND CONSTRUCTION TOLERANCES

- A. Shape the surface to the required template and as staked. Surface shall be graded and shaped smooth to within ½-inch in 10 feet.
- B. Maintain the aggregate course to the correct lines, grade, and cross-section by blading, watering, and rolling until placement of the next course.
- C. Upon completion of full placement and after haul trucks have completed their haul across section of the road, the road shall be finish bladed, watered, and rolled.
- D. Aggregate shall be placed as shown on the drawings and as staked. Tolerance for thickness of aggregate shall be +/- ½-inch and for width shall be + 1-foot.

3.6 ACCEPTANCE

- A. Aggregate shall be accepted following placement when shown to meet material quality, gradation, compaction requirements, required depth and width, and finish blading.

END OF SECTION 321204

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 322640 - PAVEMENT MARKING

PART 1 - GENERAL

1.1 SUMMARY

- A. This item shall consist of furnishing and applying the paint markings along the centerline and/or shoulders of the road, the individual lines for parking stalls, cross walks, directional arrows, letters, numerals, or signs on the roads for the control of traffic, at locations as shown on the drawings, marked in the field, or as directed by the Contracting Officer.
- B. All work shall comply with the direction in the Manual of Uniform Traffic Control Devices (MUTCD).

1.2 DEFINITIONS

- A. DOT: Department of Transportation.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.5 PROJECT CONDITIONS

- A. Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4 deg C) for oil-based materials, 50 deg F (10 deg C) for water-based materials, and not exceeding 95 deg F (35 deg C).

1.6 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type I or AASHTO M 248, Type N or F.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 3 minutes.
- C. Glass Beads: AASHTO M 247, Type 1.

2.2 COLORS

- A. Colors for commonly used lines, marking, and symbols are as follows:
 - 1. Parking Stall Lines: Yellow.

2. Fog Lines on Edges of Road: White.
3. Twelve-Inch-Wide Stop Lines: White.
4. Road Traffic Lane Divider Lines: Yellow.
5. Speed Bump: White
6. International Symbol of Accessibility: White on Blue background.
7. Directional Arrows: White.

PART 3 - EXECUTION

3.1 GENERAL

- A. The Contractor shall be responsible for preliminary spotting of the lines to be painted and approval by the Contracting Officer must be obtained before applying pavement-marking paint.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust. The area to be painted shall be dry, clean, and free of loose particles.
- D. Apply paint with mechanical equipment to produce pavement markings, of required dimensions, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm). The equipment shall include a mechanical bead dispenser that will distribute the glass beads uniformly into the wet pavement markings at a rate of 6 lb/gal. (0.72 kg/L).
- E. Stripes shall be 4 inches wide. Broken line segments (dashed or skip traffic strip) shall be 10 feet in length with 30-foot gaps, or 2 feet in length with 4-foot gaps.
- F. Arrows and letters shall be of the dimensions as shown on the drawings.
- G. The painted area shall be protected from traffic until the paint is thoroughly dry.
- H. All markings shall present a clean-cut, uniform appearance. All markings which fail to have a uniform appearance, either day or night, shall be corrected by the Contractor.

3.2 DISPOSAL

- A. Dispose of excess construction material in accordance with Section 024100 "Waste Material Disposal".

END OF SECTION 322640

December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 322705 - PAVEMENT SAWING

PART 1 - GENERAL

1.1 SUMMARY

- A. This item consists of sawing pavements as required to provide a smooth surface to match existing grades.

1.2 MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PROCEDURE

- A. Make a vertical cut through the full depth of surface in a straight line.
- B. Where the edge of the existing surface is cracked, broken, or deteriorated, make the cut so the defective surface can be removed.
- C. Do not allow traffic or construction equipment to cross the cut edge.
- D. Apply a tack coat, as shown on the drawings, to the cut edge before placing hot mix asphalt surfacing.

END OF SECTION
December 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 328000 - IRRIGATION SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This item shall consist of furnishing all labor, equipment, and materials for the design, construction, and installation of a sprinkler system according to an approved design submitted by the contractor and in accordance with these specifications.

1.2 SUBMITTAL

- A. Irrigation System Design – for proposed system.
- B. Product Data – for product items listed in Part 2.
- C. Operations and Maintenance Manuals.

1.3 REFERENCE SPECIFICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
 - 1. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - 2. ASTM D1784 Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated PolyVinyl Chloride (CPVC) Compounds
 - 3. ASTM D1785 Standard Specification for PolyVinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - 4. ASTM D2241 Standard Specification for Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

1.4 MEASUREMENT AND PAYMENT

- A. Measurement and Payment for the Irrigation System shall be lump sum. Payment shall include the design and layout, all piping, valves, wiring, controllers, drains, backflow prevention, vacuum breakers, sprinkler heads, drip emitters, tubing, valve boxes, hose bibs, drains and other items to complete the system ready for use.

PART 2 - MATERIALS

2.1 IRRIGATION SYSTEM DESIGN

- A. An irrigation system meeting the requirements of this specification and covering area shown on the drawings shall be designed and submitted for review and approval by the Contracting Office. The design shall include at a minimum the following:
 - 1. Site drawing (to scale) - showing the proposed location of the system piping sprinkler heads, zones, drip irrigation, micro-spray emission devices, tubing and other irrigation appurtenances.
 - 2. Wiring diagram for power, signal, and control wiring.
 - 3. List brand, models, sizes, types, and pressure ratings of irrigation features and appurtenances (valves, heads, piping, etc.).
 - 4. System shall be designed to:
 - a. Provide 100 percent coverage of the area shown for lawn, sprinklers shall provide for full overlap, zones shall be balanced to provide uniform coverage, and be designed for available water flows at the site, but no more than 18 GPM per zone.

- b. Provide drip irrigation coverage in planter bed, xeriscape areas. These zones shall operate independently of lawn valve zones and be designed with pressure regulators and other devices common to the trade.

2.2 SPRINKLERS AND EMISSION DEVICES

- A. General Requirements: Designed for uniform coverage over entire spray area indicated at available water pressure.
- B. Plastic, Exposed, Impact-Drive Rotary Sprinklers:
- C. Install new broadcast emission devices of the following type, or approved equal.
 - 1. ABS Bodies and Nozzles, corrosion resistant internal parts.
 - 2. Plastic, Pop-up, Gear-Drive Rotary Sprinklers:
 - 3. Plastic Surface Pop-up Sprinklers - Rainbird Popup Spray Sprinklers: 1804 Series (4" popup with ½" inlet), fixed with flow adjustment.
 - 4. Plastic micro-spray, xeri-spray, bubbler, drip emitter emission devices.
 - 5. Rainbird sprinkler components labeled with the manufacturer's name and model number.

2.3 BALL / ISOLATION VALVES

- A. All ball valves for sizes ¾" through 2", with quarter turn twist handles, shall be Spears or an approved equal and be manufactured of PVC. Use new valves labeled with the manufacturer's name and model number.

2.4 AUTOMATIC CONTROL VALVES

- A. Install electric valves of the following type, or approved equal:
 - 1. Valves: Rainbird PESB Series.
 - 2. Description: Molded-plastic body, normally closed, diaphragm type with manual-flow adjustment, and operated by 24-V ac solenoid.

2.5 GATE VALVES – STOP/WASTE AND ISOLATION VALVES

- A. The kinds of gate valves, stop/waste valves and isolation valves with cross handles shall be as follows:
 - 1. Rain Bird 1" isolation valve (or approved equal) - manufactured of brass
 - 2. Spears 1" stop/waste valve (or approved equal) - manufactured of brass

2.6 AUTOMATIC DRAIN VALVES

- A. Description: Spring-loaded-ball type of corrosion-resistant construction and designed to open for drainage if line pressure drops below 2-1/2 to 3 psig (17 to 20 kPa).

2.7 BACKFLOW PREVENTER (if not provided)

- A. The backflow preventer shall be FEBCO, 1" 850 double check assembly bronze with insulated hot box cover or approved equal.
 - 1. The backflow preventer device shall meet or exceed the requirements as outlined in the city codes and ordinances.

2.8 PIPE – GENERAL

- A. Use new water lines (pipe and fittings), of the type, pressure rating or class, and size (nominal diameter) shown on the drawings or listed in the Schedule of Items. The pipe and fittings used for the water lines shall conform to the following applicable specifications:

- B. Polyvinyl Chloride (PVC) Plastic Pipe and Fittings - All PVC pipe must meet the requirements as set forth in ASTM D2241 or ASTM D1785. All material must meet ASTM D1784. Pipe shall be solvent weld type joint. Pipe sizes 1/2", 3/4", 1", 1-1/4", and 2" shall be class 200 and 2" pipe shall be class 160. All fittings shall be Schedule 40.
- C. Steel Pipe and Fittings - Steel pipe and fittings up to and including two inches in diameter shall be threaded and coupled, galvanized, and conform to the requirements of ASTM A53. Steel pipe and fittings larger than two inches in diameter shall be furnished as specified on the drawings. Fittings such as manufactured by Rockwell International, flanged joints and fittings, and pipe other than screwed galvanized steel will be specified on the drawings.
- D. PE Pipe with Controlled ID: ASTM F 771, PE 3408 compound; SIDR 11.5.
 - 1. Insert Fittings for PE Pipe: ASTM D 2609, nylon or propylene plastic with barbed ends. Include bands or other fasteners.
- E. Flexible Swing Pipe – Flex tubing shall be Rainbird SPX Series, SPX-FLEX, 80 psi 1/2" inch diameter constructed of low density polyethylene material with wall thickness of .098 or an approved equal.
- F. Spiral Barb Fittings – Barb fittings shall be Rainbird SBE 050, 80 psi 1/2" inch diameter and used in conjunction with swing pipe as a flexible swing assembly for 1/2" inlet sprinklers or an approved equal.

2.9 PIPING JOINING MATERIALS

- A. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.10 CONTROLLER

- A. Rainbird ESP-Modular Controller, model number ESP-6M (6 stations w/master valve) outdoor or an approved equal. *The number of stations in the controller will need to match the irrigation design submitted.
- B. Controller Stations for Automatic Control Valves: Minimum of 6 stations, each station is variable from approximately 5 to 60 minutes. Include switch for manual or automatic operation of each station. . *The number of stations in the controller will need to match the irrigation design submitted.
 - 1. Exterior Control Enclosures: NEMA 250, Type 4, weatherproof, with locking cover and two matching keys; include provision for grounding.
 - a. Body Material: Molded plastic.
 - 2. Mounting: Surface type for wall.
 - 3. Control Transformer: 24-V secondary, with primary fuse.
 - 4. Timing Device: Adjustable, 24-hour, 14-day clock, with automatic operations to skip operation any day in timer period, to operate every other day, or to operate two or more times daily.
 - a. Manual or Semiautomatic Operation: Allows this mode without disturbing preset automatic operation.
 - b. Nickel-Cadmium Battery and Trickle Charger: Automatically powers timing device during power outages.
 - c. Surge Protection: Metal-oxide-varistor type on each station and primary power.
 - 5. Wiring: UL 493, Type UF multi-conductor, with solid-copper conductors; insulated cable; suitable for direct burial.
 - a. Feeder-Circuit Cables: No. 12 AWG minimum, between building and controllers.
 - b. Low-Voltage, Branch-Circuit Cables: No. 14 AWG minimum, between controllers and automatic control valves; color-coded different from feeder-circuit-cable jacket color; with jackets of different colors for multiple-cable installation in same trench.
 - c. Splicing Materials: Manufacturer's packaged kit consisting of insulating, spring-type connector or crimped joint and epoxy resin moisture seal; suitable for direct burial.

2.11 WIRE

- A. Use 18 gauge, 6-strand wire to secure valve sleeves to the valves.

2.12 GRAVEL DRAIN MATERIAL

- A. Use well-graded gravel ranging in size from 2-inch maximum to 1/4 inch minimum.

2.13 CONDUIT - SLEEVING

- A. Use 3-inch diameter SCH. 40 pipe with end caps.

2.14 BEDDING MATERIAL

- A. Use bedding material either commercially purchased sand or native excavated soil that is free of rocks and other hard objects. Any native material to be used for backfill is conditional upon the Contracting Officer's approval.

2.15 VALVE AND BOXES

- A. Boxes shall be screw lockable as manufactured by Christy or approved equal. Valve boxes shall be the color of surrounding landscape materials.
- B. Shape: Rectangular.
- C. Labeled - IRRIGATION

PART 3 - CONSTRUCTION METHODS

3.1 TRENCHING

- A. Trench a minimum of 24 inches in depth for all mainlines and 18 inches in depth for all lateral lines and allow for a minimum of 2 inches clearance on the sides after the pipe is installed.
- B. Backfill and compact trenches in 6" lifts. Haunch soil around piping. When backfilling is complete, water over the top of trenches until standing water is visible. Add additional soil in any settled low spots to create a uniform finished surface.

3.2 INSTALLATION OF PIPE

- A. Handle and lay pipe in conformance to the manufacturer's recommendations by skilled workmen of the trade. If more than one pipe is to be laid in a trench, then a minimum of one-inch of bedding material is to be placed between the two pipes. Place two-inches of bedding material in the bottom of the trench prior to installing PVC and galvanized steel pipe. The full length of each section of pipe shall rest upon the bed for the full length of its barrel. Keep interior of all pipe and fittings free as possible from dirt on the inside, during shipment, storage, and installation. At times when work is not in progress, cover all open ends of pipes and fittings so that dirt, rocks, and other substances will not enter the pipe. At no time may there be less than 14 inches of cover over the pipe.

3.3 INSTALLATION OF VALVES AND VACUUM BREAKERS

- A. Install all valves and vacuum breakers in the line where shown, and of the appropriate size as called for, on the drawings. Install valves with unions on each side according to the manufacturer's recommendations. Install vacuum breakers according to the manufacturer's recommendations and local codes. Install pressure vacuum breakers with a gate valve on each side, in the same size as the vacuum breaker, and as shown on the drawings.

3.4 MAINTENANCE OF SPRINKLER SYSTEM

- A. Maintain the sprinkler system in a satisfactory condition until the completed system has been accepted by the Contracting Officer.

3.5 FLUSH LINES

- A. Flush all pipe lines prior to installing the sprinkler heads to ensure the removal of any foreign material.

3.6 INSTALLING SPRINKLER HEADS / EMISSION DEVICES

- A. Install the sprinkler heads and/or emission devices in accordance with the manufacturer's recommendations. Adjust all heads or emission devices to cover the intended area with the appropriate spray pattern and radius. Remove, clean and reinstall any head or emission device that becomes clogged. Maintain entire irrigation until system has been completed and the 30 day plant material establishment period has passed and plants have been accepted.

3.7 DRAIN VALVES

- A. Install 1/2-inch auto drain valves at all low points in the irrigation system lateral lines between the zone valve and the last sprinkler. Locate all auto drain valves and slope the irrigation pipe to these valves. The frequency of drain valves shall be common to industry standards and their location shall be approved by the Contracting Officer. Install each drain valve on a tee off the lateral pipe line (except for drain valves at the end of a lateral) with a PVC street ell pointed down. One cubic foot of gravel drain material shall be placed beneath each drain valve.

3.8 CONDUITS - SLEEVES

- A. Locate conduits just below the base of the sub grade of the roadbed and sidewalks. Extend conduit a distance of two feet beyond sidewalk edges, five feet beyond curbs and ten feet beyond asphalt edges when no curb exists.

3.9 GUARANTEE OF COVERAGE

- A. Install the irrigation system as designated on the approved drawings to the extent that it fits the site. If dimensional discrepancies occur between the drawings and actual field conditions, adjust the location and number of sprinkler heads, and pipe location and size, to achieve adequate coverage. If this condition is encountered, prepare a proposal to solve the problem and contact the Contracting Officer for approval of the proposal before proceeding.

3.10 PRESSURE TESTING

- A. Mainline and lateral lines
 - 1. After a section of irrigation system has been installed, pressure test for a period of not less than one-hour with at least 95 pounds of pressure or the highest pressure confirmed at the site. Notify the Contracting Officer at least 24-hours prior to backfilling the trench and beginning the test. Repair any leaks found and schedule a new pressure test. Notify the Contracting Officer as before.

3.11 AS-BUILT DRAWINGS

- A. Keep accurate drawings on the location of pipe, pipe sizes, type of sprinkler heads, emission devices, valves, valve sizes (including drain valves), vacuum breakers, and vacuum breaker sizes. Submit a hard line copy of this information to the Contracting Officer.

END OF SECTION 328000

May 2013

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION
SECTION 329220 - DRAINAGE STRUCTURE

PART 1 - GENERAL

1.1 SUMMARY

- A. This item shall consist of a drainage structure, including excavation and materials that is delivered to the project site, stored on site and installed on site.

1.2 SUBMITTAL

- A. Material Samples: The contractor shall submit landscape stone samples. The samples shall include the color and size of the landscape stone material. The Contracting Officer shall approve the submitted stone samples prior to the Contractor ordering the materials. Section 013300 "Submittal Procedures" Prepare and submit Action Submittals requiring approval by the Contracting Officer (CO) for the material described in section 2.1.

1.3 DEFINITIONS

- A. Drainage Structure is defined as:
 - 1. Excavation: Excavation of drainage structure to the depth and dimensions AS SHOWN ON THE DRAWINGS.
 - 2. Landscape Stone: Stone/rock material that is round or angular in shape and 2" - 4" in size.
 - 3. Fabric Underlayment: UV treated polyethylene fabric.

1.4 METHOD OF MEASUREMENT AND PAYMENT

- A. There will be no separate measurement or payment for work in this Section. Water distribution is considered incidental to other items of work shown in the Schedule of Items.

PART 2 - PRODUCTS

2.1 LANDSCAPE STONE:

- A. Obtain landscape stone from a commercial supplier approved by the contracting officer. Landscape stone shall be free of roots, sod, debris and fines. All landscape stone shall be obtained from the same source.
- B. Landscape stone shall be stone/rock material that is round or angular in shape and 2" - 4" in size with uniform color and size. The mulch shall be medium to light grey in color with a "natural" appearance and be approved by the contracting officer.

2.2 FABRIC UNDERLAYMENT

- A. Fabric underlayment shall be UV treated polyethylene fabric. Obtain fabric underlayment from a commercial supplier approved by the contracting officer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clear the area that will receive the drainage structure of all objectionable material including brush and sod.
- B. EXCAVATION
- C. Soil shall be excavated to the depth and dimensions AS SHOWN ON THE DRAWINGS and as directed by the Contracting Officer. Excavated material shall be dispersed and spread onsite. Excavated trench shall

be approved by the contracting officer prior to placement of fabric underlayment and landscape stone material.

3.2 STOCKPILING

- A. Locate stockpiled stone as directed in as small an area as reasonably possible.

3.3 SPREADING

- A. Spread landscape stone to a uniform 12-inch depth in excavated trench AS SHOWN ON THE DRAWINGS. Spreading shall not be done when the ground or topsoil is excessively wet, or otherwise in a condition detrimental to the work.
- B. Fabric underlayment shall be tacked to the ground with stakes in the locations and spacing as recommended by the manufacturer. Overlap all fabric seams 12-inches. All excess fabric shall be trimmed with clean edges. No exposed fabric underlayment will be accepted.

3.4 FINISH AND CLEANUP

- A. Sweep excavated material and landscape stone spills from paved and concrete surfaces. Remove roots, sod, and other debris from the excavated native soil. Set drainage structure areas to a smooth contour.
- B. When drainage structure and fabric underlayment installation are complete, the area shall be finish graded to match the surrounding natural grade and shall be cleaned up by removing all debris and unutilized materials.

END OF SECTION 329220

February 2014

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION

SECTION 329310 - EXTERIOR PLANTS, LANDSCAPE BOULDERS AND TOPSOIL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Trees
 - 2. Shrubs
 - 3. Groundcover (SF)
 - 4. Plants
 - 5. Planting Media Top Soil for Groundcover Areas
 - 6. Landscape Boulders
 - 7. Landscape Boulders (oversize)

1.2 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Media: Mix native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil.
- E. Boulders: A rock material that averages 3' x 3' in size.
- F. Oversize Boulders: A rock material that averages 5' in length exposed above finished grade and 30" minimum in diameter in size.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery.
- B. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set exterior plants/trees in shade, protect from weather and mechanical damage, and keep roots moist.

1.4 WARRANTY

- A. Special Warranty: Warrant the following exterior plants, for the warranty period indicated, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, or incidents that are beyond Contractor's control.
 - 1. Warranty Period for Trees, Spaded Trees and Shrubs: One year from date of Substantial Completion.
 - 2. Warranty Period for Ground Cover and Plants: Six months from date of Substantial Completion.

1.5 MEASUREMENT AND PAYMENT

- A. Exterior Plants, Boulders, Planting Media : Measurement shall be Lump Sum (LS) for exterior plants, fertilizer, and mulch delivered, transported, and installed in the locations and AS SHOWN ON THE DRAWINGS.

PART 2 - PRODUCTS

2.1 EXTERIOR PLANTS

- A. Tree and Shrub Material: Furnish and install all plant materials as shown in the plant schedule in the drawings. Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1. Provide balled and burlapped trees and container-grown shrubs.
- B. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.
- C. Perennials: Provide healthy, field-grown plants from a commercial nursery, of species and variety shown or listed.

2.2 PLANTING MATERIALS

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch (25mm) or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil.
 - 2. Topsoil Source: Obtain topsoil from an approved supplier. Topsoil shall be reasonably free of roots, sod, and rock particles over 1-inch diameter.
- B. Fertilizer:
 - 1. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - a. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight]
 - 2. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - a. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight
- C. Planting Soil Amendment Mulch:
 - 1. Organic Mulch: Ground or shredded bark
 - 2. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch (25-mm) sieve.
 - 3. Mineral Mulch: Crushed stone or gravel
 - a. Size Range: 3/4 inch (19 mm) maximum, 1/4 inch (6 mm) minimum
 - b. Color: Uniform color range

2.3 PLANTING MEDIA

- A. Planting Media: Mix topsoil with the following soil amendments and fertilizers in the following quantities:
 - 1. Ratio of Loose Compost to Topsoil by Volume: 1:3

2. 50 lbs. of Commercial Fertilizer per 1000 Sq. Ft. (92.9 Sq. m)

2.4 PLANTING MEDIA TOP SOIL FOR GROUND COVER AREAS

- A. Planting Media Top Soil: Top soil shall be a loam mix of 40% sand, 40% silt and 20% clay. Top soil shall be free of debris and any rocks or objects larger than 1/8" in size.

2.5 LANDSCAPE BOULDERS

- A. Landscape boulders: The boulders used for this work shall be angular, sound, hard, and free from laminations, fractures, or other structural defects. They shall be of such quality that they will not disintegrate on exposure to water or weathering.
- B. Rocks used shall have a volume of greater than 8 cubic feet (approximately 1300 pounds) or average 3-feet by 3-feet by 4-feet in size.
- C. Source: Rocks shall be purchased from a commercial source.

2.6 OVERSIZE LANDSCAPE BOULDERS

- A. Oversize landscape boulders: The boulders used for this work shall be sound, hard and free from laminations, fractures, or other structural defects. They shall be of such quality that they will not disintegrate on exposure to water or weathering.
- B. Oversize landscape boulders used shall have dimensions of a minimum 5' high in length above finished grade and a minimum 30" in width.
- C. Source: Oversize landscape boulders shall be purchased from a commercial source.

PART 3 - EXECUTION

3.1 EXTERIOR PLANTING

- A. Bed Establishment:
 1. Loosen subgrade of planting beds to a minimum depth of 6 inches (150 mm).
 2. Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 3. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix.
 4. Spread planting soil mix to a depth of 12 inches (300 mm) but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 5. Finish Grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- B. Trees and Shrubs:
 1. Pits and Trenches: Excavate circular pits with sides sloped inward. Trim base leaving the center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation. Excavate approximately three times as wide as ball diameter.
 2. Set trees and shrubs plumb and in center of pit or trench with top of root ball flush with adjacent finish grades.
 - a. Balled and Burlapped: Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - b. Container Grown: Carefully remove root ball from container without damaging root ball or plant.

- c. Fabric Bag Grown: Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - d. Place planting soil mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix.
 - 3. Organic Mulching: Apply 3-inch (50-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems.
 - C. Tree and Shrub Pruning: Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning.
 - D. Ground Cover and Plant Planting:
 - 1. Set out and space ground cover and plants 6-inches (300 mm) apart as indicated.
 - 2. Dig holes large enough to allow spreading of roots, and backfill with planting soil.
 - 3. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
 - 4. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
 - 5. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.
 - E. Planting Bed Mulching:
 - 1. Mulch backfilled surfaces of planting beds and other areas indicated. Apply 3-inch (75-mm) average thickness of mulch, and finish level with adjacent finish grades. Do not place mulch against plant stems.
 - F. Planting Media Top Soil For Groundcover Areas:
 - 1. Top soil shall be installed to a uniform compacted 3-inch depth.
 - 2. Top soil shall be installed evenly and rough raked to a 1-inch depth ready to receive 4-inch groundcover pots.
 - G. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting.
 - H. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Government property.
- 3.2 LANDSCAPE BOULDERS
- A. Landscape boulders shall be planted with the best side up (clean prior to planting). Plant boulders 1/3 depth into the ground and backfill all voids.
 - B. Oversize landscape boulders shall be planted with the best side up (clean prior to planting). Plant oversize boulders a minimum 1/3 depth of the overall size or as necessary to obtain a structurally sound installation.

END OF SECTION 329310
March 2018

USDA FOREST SERVICE, R4
FLAMING GORGE RANGER DISTRICT ADDITION

SECTION 329400 - LANDSCAPE STONE, WOOD MULCH, WEED BARRIER & LANDSCAPE EDGING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Landscape Stone Cobble
2. Flagstone
3. Wood Mulch
4. Weed Barrier Underlayment
5. Steel Edging

B. Related Sections include the following:

1. Section 321204 "Crushed Aggregate Base or Surface Course" for preparing subgrade.

1.2 Definitions:

1. Landscape stone mulch:
 - a. Landscape stone mulch is rock, cobble and/or gravel material.
2. Landscape wood mulch:
 - a. Landscape wood mulch is a shredded, fibrous type of organic material that has been screened and/or stained and is free of debris.

1.3 SUBMITTAL

A. Material Samples:

1. Stone: Submit source, gradation and material properties. The contractor shall submit landscape stone mulch samples. The sample shall include the color and size of the stone mulch material.
2. Wood Mulch: The contractor shall submit landscape a wood mulch sample. The sample shall include the color and size of the wood mulch material.
3. The Contracting Officer shall approve the submitted stone, and wood mulch prior to the Contractor ordering the materials.

B. Product Data: Weed Barrier Underlayment.

1.4 MEASUREMENT AND PAYMENT

1. Landscape Stone, Weed Barrier, Steel Edging: Measurement shall be Lump Sum (LS) for landscape stone, flagstone, wood mulch, weed barrier and edging delivered, spread and/or installed to the lines, locations and depths AS SHOWN ON THE DRAWINGS. Measurement and payment shall include site preparation and grading, delivering items to the project site, storing on site, spreading and/or installing the items on site.

PART 2 - PRODUCTS

2.1 LANDSCAPE STONE AND FLAGSTONE:

1. Obtain landscape stone and flagstone from a commercial supplier approved by the contracting officer. Landscape stone and flagstone shall be clean, free of roots, sod, and debris.
2. All landscape stone and flagstone shall be obtained from the same source.
3. Landscape stone shall be uniform color and size. The stone shall be "natural" in color and as approved by the contracting officer.

4. Landscape stone shall consist of rounded river rock material sized 2"- 4".
5. Flagstone shall vary in size and meet the dimensions AS SHOWN ON THE DRAWINGS.

2.2 WOOD MULCH:

1. Obtain landscape wood mulch from a commercial supplier approved by the contracting officer. Landscape wood mulch shall be free of roots, sod, and debris.
2. Landscape wood mulch shall be a fibrous, shredded type with uniform color and size. The wood mulch shall have a uniform dark stained color as approved by the contracting officer.
3. All landscape wood mulch shall be obtained from the same source.

2.3 WEED BARRIER UNDERLAYMENT

A. Landscape Fabric Weed Barrier:

1. Weed barrier underlayment shall be UV treated polypropylene fabric, 4.1 ounces/square yard, min. 20 mils. Thick, permeability of 7 gallons/sf/minute. Color - Black. Obtain weed barrier underlayment from a commercial supplier approved by the contracting officer.
2. Weed Barrier shall be installed under all 2"- 4" cobble.

2.4 STEEL EDGING:

A. Size:

1. Steel edging shall be 3/16" thick by 4" tall. Edging shall be in 16' sections.

B. Stakes:

1. Heavy duty interlocking aluminum stakes shall be used to anchor edging to the ground. 16' sections require (5) 12" aluminum stakes or as required by the manufacturer.

C. Color:

1. Color shall be Mill Finish – Natural Aluminum or approved equal.

- D. Obtain steel edging and stakes from a commercial supplier as approved by the contracting officer. A known product that meets this specification is available from: Permaloc Corporation, MI Ph: 616-399-9600 <http://www.permaloc.com> or an approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clear the area to that will receive weed barrier underlayment, wood mulch, poly bender board edging and stone mulch of all objectionable material including brush and sod. Soil shall be stripped clean and clear as directed by the Contracting Officer. Subgrade and area shall be approved by the contracting officer prior to placement of the materials listed in this section.

3.2 STOCKPILING

- A. Locate stockpiled wood mulch, stone, etc. as directed in as small an area as reasonably possible.

3.3 SPREADING

- A. Spread landscape stone, wood mulch to a uniform in designated areas AS SHOWN ON THE DRAWINGS. Spreading shall not be done when the ground or topsoil is excessively wet, or otherwise in a condition detrimental to the work.
- B. Spread landscape wood mulch to a uniform 3-inch depth on designated areas AS SHOWN ON THE DRAWINGS. Spreading shall not be done when the ground or topsoil is excessively wet, or otherwise in a condition detrimental to the work.

- C. Weed fabric underlayment shall be tacked to the ground with stakes in the locations and spacing as recommended by the manufacturer. Overlap all weed fabric seems 12-inches.

3.4 FLAGSTONE

- A. Install flagstone level and plumb. Overlap flagstone with each course creating an offset interwoven stack. Vary the sizes of flagstone with each course installed. Use wider flagstone for the finished top course to act as a capstone that overhangs the stacked courses below extending out 1 to 2 inches.

3.5 STEEL EDGING

- A. Steel edging shall be installed straight and plumb and placed at 90 degree angles AS SHOWN ON THE DRAWINGS. Install and anchor with stakes per manufacturer's installation requirements. Top of edging to be maximum 1/2" above surface material finished grade.

3.6 FINISH AND CLEANUP

- A. Sweep landscape stone, wood mulch and masonry sand spills from aggregate, paved and concrete surfaces. Remove roots, sod, and other debris from the spread native soil. Set landscape stone and wood mulch areas to a smooth contour.
- B. When landscape stone and weed barrier underlayment installations are complete, the area shall be finish graded to match the surrounding natural grade and shall be cleaned up by removing all debris and unutilized materials.

END OF SECTION 329400

May 2013