LEAVENWORTH NATIONAL FISH HATCHERY

SURFACE WATER INTAKE FISH SCREENS AND FISH PASSAGE PHASE II PIPE REHABILITATION

Columbia Basin Project, Washington

Columbia Pacific-Northwest – Region 9

Solicitation No. 140R1026R0001

U.S. Department of the Interior

Specifications
June 2026

This solicitation issued by
Contracting Officer
Pacific Northwest Region
Bureau of Reclamation
1150 North Curtis Road, Suite 100
Boise ID 83706-1234

LEAVENWORTH NATIONAL FISH HATCHERY SURFACE WATER INTAKE FISH SCREENS AND FISH PASSAGE PROJECT

PHASE II PIPELINE REHABILITATION

COLUMBIA BASIN PROJECT - WASHINGTON

FOREWORD

Work is located approximately 4 miles southwest of Leavenworth, Washington, in Chelan County. Work is for rehabilitating and replacing existing pipeline.

Principal components of the work include the following:

1. Installation of a parallel pipeline on US Fish and Wildlife Service Land.
2. Installation of equipment vaults, electrical work, replacing valves on US Fish and Wildlife Service Land.

PRE-PROPOSAL SITE VISIT: SEE SECTION L FOR SITE VISIT INFORMATION. ATTENDEES ARE TO PROVIDE AND WEAR SAFETY BOOTS, HARD HATS, AND SAFETY VESTS.

FOR DATE AND TIME PROPOSALS ARE DUE, SEE "SOLICITATION, OFFER, AND AWARD," STANDARD FORM 1442.

FOR INFORMATION REGARDING BUREAU OF RECLAMATION'S PUBLICATION "RECLAMATION SAFETY AND HEALTH STANDARDS" INCLUDING REVISIONS AT https://www.usbr.gov/safety/rshs/index.html WHICH IS APPLICABLE TO WORK UNDER THIS CONTRACT, SEE CLAUSE AT WBR 1452.223-81, SAFETY AND HEALTH.

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BUREAU OF RECLAMATION

TECHNICAL SERVICE CENTER

WRITTEN SPECIFICATIONS SIGNATURE SHEET

Specifications Title: LEAVENWORTH NATIONAL FISH HATCHERY SURFACE WATER INTAKE FISH SCREENS AND FISH PASSAGE

Project Title: PHASE 2 PIPELINE REHABILITATION (TRENCH ONLY)

Region: COLUMBIA PACIFIC-NORTHWEST

Prepared: MICHAEL VON BUHR Digitally signed by MICHAEL VON BUHR Date: 2025.12.08 10:37:50 -07'00' P.E.

Technical Approval: Kylie Pelzer, P.E. Digitally signed by KYLIE PELZER Date: 2025.12.11 14:50:33 -07'00' P.E.

Certified: ROBERT CARLSON Digitally signed by ROBERT CARLSON Date: 2025.12.12 08:57:22 -07'00' P.E.

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CONTINUATION OF

SECTION B – SUPPLIES OR SERVICES AND PRICES/COSTS

LEAVENWORTH NATIONAL FISH HATCHERY SURFACE WATER INTAKE FISH SCREENS AND FISH PASSAGE PROJECT
PHASE II PIPELINE REHABILITATION

COLUMBIA BASIN PROJECT - WASHINGTON

B.1 PRICE SCHEDULES

(a) Offers will be considered for award on the following Price Schedule, but no offer will be considered for award on only a part of the Price Schedules.

(1) Offerors shall complete the full Price Schedule. Offers submitted with an incomplete Price Schedule may be considered nonresponsive and not evaluated for award.

(2) Offers will be evaluated based on the best value to the Government and may not necessarily be the lowest total of the Price Schedule.

(b) Offers are subject to the terms and conditions of this solicitation.

(c) Quantities in the Price Schedule are estimated quantities for comparison of offers only. Except as provided in the contract, no claim shall be made against the Government for overruns or underruns.

(d) See the contract clause at WBR 1452.232-81, Payment for Mobilization and Preparatory Work, for CLIN 1, in the Price Schedule.

(e) Clauses and Provisions in this solicitation apply to all of the CLINs.

(f) Definitions:

(1) CLIN - Contract Line Item Number.

PRICE SCHEDULE

CLIN	Section	Supplies or Services	Quantity and Unit	Unit Price	Amount
1	WBR 1452.232 -81	Mobilization and Preparatory Work	For the lump-sum of		$
2	01 31 30	Contract Document Management System	For the lump-sum of		$
3	02 41 10	Site Demolition	For the lump-sum of		$
4	02 82 20	Asbestos Inspection	For the lump-sum of		$
5	02 82 20	Asbestos-Containing Material Abatement	15 sq ft	$	$
6	03 30 00	Reinforced Concrete	14 cu yd	$	$
7	26 05 02	Complete Electrical System	For the lump-sum of		$
8	31 03 10	Diversion and Care of Water During Construction	For the lump-sum of		$
9	31 11 00	Clearing and Grubbing	1.75 acre	$	$
10	31 14 10	Stripping	7,800 sq yd	$	$
11	31 23 11	Excavation for Structures	750 cu yd	$	$
12	31 23 11	Earthwork for Pipe Trench	11,500 cu yd	$	$
13	31 23 11	Compacted Backfill about Structures	710 cu yd	$	$
14	31 23 11	Compacted Backfill about Pipe Trench	245 cu yd	$	$
15	32 12 00	Asphaltic Concrete Replacement	2,900 sq yd	$	$
16	32 15 10	Gravel Surfacing	52 cu yd	$	$

PRICE SCHEDULE

CLIN	Section	Supplies or Services	Quantity and Unit	Unit Price	Amount
17	32 92 20	Seeding and Soil Supplements	1.75 acre	$	$
18	33 05 30	Control Valve Vault	For the lump-sum of		$
19	33 05 30	Flowmeter Vault	For the lump-sum of		$
20	33 09 12	Flowmeter	1 ea	$	$
21	33 11 18	HDPE Pressure Pipe	1,768 lin ft	$	$
22	35 21 95	Steel Piping	For the lump-sum of		$
23	35 22 14	Knife Gate Valve	1 ea	$	$
24	35 22 14	Valves and Equipment	For the lump-sum of		$

TOTAL FOR PRICE SCHEDULE $_____

END OF SECTION

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DIVISION 01 - GENERAL REQUIREMENTS

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SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 LOCATION

A. Work is located approximately 4 miles southwest of Leavenworth, Washington, in Chelan County.

1.02 PRINCIPLE COMPONENTS OF WORK

A. Excavation Support.

B. Replacing pipe in a trench parallel to existing pipe. Abandoning the existing pipe in place.

C. Installing new control valve vault.

D. Installing new flowmeter vault.

E. Installing thrust blocks, valves, and equipment.

F. Miscellaneous metalwork fabrications for control valve and flowmeter vaults.

G. Earthwork.

H. Demolition of Concrete.

I. Instrumentation.

J. Control and Monitoring System.

K. Electrical Power Distribution.

L. Installing prefabricated metal buildings.

1.03 SPECIFICATIONS REQUIREMENTS

A. Requirements in Division 1, General Requirements, apply to Divisions 2 through 53.

B. Imperative statements in these specifications are Contractor requirements, unless otherwise stated.

C. Where specifications are written in streamlined form, the words “shall be” are included by inference where a colon (:) is used within the sentence or phrase.

1.04 DEFINITIONS

A. When the specifications use a word or term defined in the Federal Acquisition Regulations (FAR), the definition of the word or term shall be in accordance with FAR sections in effect at the time the solicitation was issued.

1.05 ACRONYMS

A. The following acronyms apply to specifications Divisions 1 through 53:

1. CO: Contracting Officer.
2. COR: Contracting Officer's Representative.
3. USFWS: United States Fish and Wildlife Service.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 14 10
USE OF SITE

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. Bureau of Reclamation (Reclamation)

1.	Cleaning Manual	Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species (Technical memorandum No. 86-68220-07-05), available online at: https://www.usbr.gov/mussels/prevention

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 14 10-1, Land Use and Landscape Rehabilitation Plan:

1. For each Contractor use area and sites on Government land.

   a. Show use location and extent of impact. Uses include but are not limited to the following:

      1) Buildings and service areas including offices, shops, warehouses, storage areas, fuel and oil storage areas, and fabrication yards.

      2) Parking areas, temporary roads, and haul routes.

      3) Bridges and culverts.

      4) Utilities including air, power, and water lines; fire hydrants; and compressor station.

      5) First-aid and medical facilities.

      6) Areas for processing, storing, and disposing of waste materials from construction operations.

      7) Temporary fences.

   b. Describe methods to preserve, protect, and repair if damaged, vegetation (such as trees, shrubs, and grass) and other landscape features on or

adjacent to the jobsite, which are not to be removed and which do not interfere with the work required under this contract. Include methods to mark work area limits, protect disturbed areas, and prevent erosion.

c. Describe methods to protect, and repair if damaged, existing improvements and utilities at or near the jobsite.

d. Describe methods for removing temporary structures and facilities, cleanup, and rehabilitating site after completion of construction activities.

2. Submit revised drawings of changes in use of Government land made during design and erection stages or after use of Government land is in operation.

C. RSN 01 14 10-2, Other Land Use Coordination:

1. Contractor shall submit request for private land use not shown on drawings (e.g. contractor yards, other parking areas, etc.).

a. Contractor shall not directly contact or coordinate with private landowners.

2. Contractor shall identify any potential use of private land not shown as Contractor Use Areas on drawings.

a. Show use, location, and potential impact.

1) Buildings and service areas including offices, shops, warehouses, storage areas, fuel and oil storage areas, and fabrication yards.

2) Parking areas, temporary roads, and haul routes.

3) Bridges and culverts.

4) Utilities including air, power, and water lines; fire hydrants; and compressor station.

5) First-aid and medical facilities.

6) Areas for processing, storing, and disposing of waste materials from construction operations.

7) Temporary fences.

b. Describe methods to preserve, protect, and repair vegetation (such as trees, shrubs, and grass) and other landscape features on or adjacent to jobsite, which are not to be removed and which do not interfere with work required under this contract. Include methods to mark work area limits, protect disturbed areas, and prevent erosion.

c. Describe methods to protect, and repair if damaged, existing improvements, and utilities, at or near jobsite.

d. Coordinate use of these lands in accordance with Section 01 57 90 - Preservation of Historical and Archeological Data.

3. Contractor shall request and pay for all Environmental Permits for these areas.

a. Obtain permits in accordance with the following sections, and other permits as necessary:

1) Section 01 57 20 – Environmental Controls

2) Section 01 57 30 – Water Pollution Control

b. In the event that environmental compliance work has not already been completed in these other land use areas, the Contractor shall coordinate with the Government and request and pay for all work related to compliance with the National Historic Preservation Act, the National Environmental Policy Act, the Native American Graves Protection and Repatriation Act, and related environmental compliance standards.

4. Review of these submittals will take a minimum of 45 days.

1.04 PROJECT CONDITIONS

A. Government land as shown on Drawing 222-D-60347 may be used for required construction facilities.

B. Government will obtain private land accesses shown on drawings prior to construction.

1. If additional private land access is needed, submit request to the CO.

a. Additional private land access is subject to environmental review prior to use.

2. Do not directly contact private landowners.

C. Location, construction, operation, maintenance, and removal of construction facilities on Government land will be subject to approval of the COR.

D. Do not interfere with work of other contractors or the Government in vicinity, or with reservations made by the Government for use of such land.

E. Provide access for government maintenance crews.

F. Housing for construction personnel will not be permitted on Government land, except housing for guards or watchmen as approved by the COR.

G. Refer to Section 01 57 30 - Water Pollution Control for restrictions of water from or into Icicle Creek.

H. Natural Conditions:

1. Ambient Temperature Range: Averages 26 to 81 degrees Fahrenheit.

2. Annual Average Precipitation:

a. Rain: 21-inches.

b. Snow: 48-inches.

3. Altitude: 1,130 to 1,165 feet.
4. Wind: 5.2 miles per hour.

1.05 WORK HOURS

A. For work hours and material deliveries refer to Section 01 14 12 – Work Restrictions.

1.06 OTHER CONTRACTS

A. During work under this contract, other work may be performed in the vicinity of the work or that may impact hatchery operation.

B. Cooperate and coordinate with other contracts' contractors, including access, use of areas, and scheduling. Comply with the clause at FAR 52.236-8, Other Contracts.

C. Do not interfere with work of other contractors or the Government in the vicinity of the work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CLEANING

A. Construction Equipment:

1. Before bringing on site, clean construction equipment to remove dirt, vegetation, and other organic material to prevent introduction of noxious weeds, and invasive plant and animal species.
2. Contractor cleaning procedures shall result in equipment being cleaned as well or better than the procedures described in Reclamation Cleaning Manual.
3. The COR will inspect construction equipment following procedures described in Reclamation Cleaning Manual before allowing the equipment onsite.

3.02 RESTORATION

A. Restore Contractor Use Areas to pre-construction condition.

END OF SECTION

SECTION 01 14 12
WORK RESTRICTIONS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO LRFD-12 Bridge Design Specifications

1.03 DEFINITIONS

A. Low-Flow Work Period: April 17 to May 13 of any given year.

1.04 WORK RESTRICTIONS

A. Allowable Work Hours:

1. Monday through Friday: 7:00 am to 5:00 pm.
   a. Work outside of these hours may be approved by the COR 72 hours in advance.
   b. The Contractor shall only be allowed on site when an authorized Government representative (i.e., Government inspector) is present.
2. No construction or other work is allowed during Federal Holidays.
3. The access gates to the site shall remain locked outside of allowable working hours.

B. Material deliveries and removal of materials from jobsite shall be restricted to allowable work hours.

1. Material deliveries and removal of materials outside of these hours must be approved by the COR 72 hours in advance.
2. Material deliveries and removal of materials from jobsite shall not be made on weekends and holidays.
3. Material deliveries require inspections by the Government before being allowed onsite. Coordinate deliveries with COR 24 hours in advance to avoid unanticipated delays during deliveries.

4. Refer to Section 01 14 30 - Interruption of Services.

C. No equipment shall enter the instream channel of Icicle Creek, except when in the Low-Flow Work Period pumping from spillway pool, near the hatchery.

1. Only materials and equipment used for the temporary bypass pumping shall enter the water, with efforts made to minimize the total in-water work.

a. Equipment shall be lowered into the spillway pool using land-based equipment.

2. Other in-water work at other locations is not permissible.

D. No blasting is allowed on-site.

E. Within 150-feet of Icicle Creek, or any waterbody, replace all petroleum based hydraulic fluids with biodegradable products.

F. Contractor shall continue to maintain water continuously to the fish hatchery via existing pipeline, except when in the Low-Flow Work Period pumping from spillway pool, near the hatchery, to hatchery outside screen chamber during work under this contract. See Section 31 03 10 – Diversion and Care of Water During Construction.

1. Pumping methods shall have a redundant system and continuous monitoring to ensure continuous flow. A minimum of 7 days notification prior of change of pumping methods shall be coordinated with the COR and USFWS Personnel.

2. Fish screens are required for pumping from the spillway pool and must be compliant with National Marine Fisheries Service and Washington Department of Wildlife criteria for anadromous fry-sized salmonids.

3. Contractor shall coordinate with other on-site contractors to ensure continuous flow.

4. Following spring release of juvenile fish, from April 17 to May 13 (low-flow period), Contractor shall maintain a minimum of 20 cfs of water continuously to the fish hatchery.

a. Maximum allowable flow: 42 cfs of water continuously to the fish hatchery.

5. All pumping materials shall be removed from site when not in Low-Flow Work Period.

6. Vehicular access across the bridge to and from the spillway pool shall be maintained at all times.

G. Spillway pool work shall be coordinated with COR.

1. Work shall be discouraged during Tribal fishing season preparations and fishing, to maximum extent practicable.

2. Tribal fishing scaffolding repairs, including near the spillway pool, occurs April 15-20 of any given year.

3. Tribal fishing occurs approximately May 1 through June 30 of any given year, and is subject to the timing of the fish runs.

H. Contractor vehicles shall be limited to HL-93 loading in accordance with AASHTO LRFD.

I. Contractor vehicles shall be limited to 10 miles per hour along dirt access roads.

J. Contractor use of private land, see Section 01 14 10 – Use of Site.

K. Contractor may utilize Government roads and trails outside of the Contractor use area shown on the drawings with prior approval of the COR.

L. Contractor use of the Contractor Staging Area 3, as shown on drawing 222-D-60347, shall be limited to April 16 to October 14 of any given year.

M. Vehicle wheel loadings and equipment loads are not permitted when there is less than 2.5 feet of earthen cover over existing pipes and utilities. Take precautions to avoid damage to existing installations and utilities in accordance with Section 01 56 10 – Protection of Existing Utilities and Installations.

N. Avoid starting construction activities during the bird breeding season (March 1 to August 31) to the maximum extent practicable.

1. When Project activities cannot start outside the bird nesting season:

a. Conduct surveys prior to scheduled activity to determine if active nests are present within the Wildlife Analysis Area and buffer any active nesting locations found during surveys.

b. Surveys should be conducted by a qualified biologist no more than seven days prior to disturbance activities.

c. If active nests are detected during these surveys a no-activity buffer zone around the nest will be established by a qualified biologist based on species, Project disturbance level, topography, existing disturbance levels, and habitat type until fledging has occurred.

2. During ongoing Project activities if a bird establishes a new nest, the nest vegetation will not be removed or modified but no buffer zone will be required. If there is a pause in Project activities greater than seven days, an additional nesting bird survey would be needed.

O. Schedule all necessary vegetation removal, trimming, and grading of vegetated areas outside of the bird breeding season (generally March 1 to August 31) to the maximum extent practicable.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 14 30
INTERRUPTION OF SERVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for items of work for which interruption of services is required.

1.02 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 14 30-1, Interruption of Electrical Services Request:

1. Area where work will be done (by number or other description).
2. Components and equipment requiring outages.
3. Outline procedures for accomplishing work including:
   a. Specific safety precautions to be taken.
   b. Type and location of barricades.
   c. Warning signs.
   d. Protective grounds and devices to be used.
4. Commencement time of work.
5. Duration of work.
6. Number of personnel and their classification.
7. Description of equipment to be used.
8. Information indicating that required materials are on site or data indicating shipping dates of materials not on site.

1.03 PROJECT CONDITIONS

A. Coordinate and schedule interruption of services with COR.

1. Coordinate work with Government operations.
2. No specific interruption of service request will be considered unless:
   a. COR has reasonable assurance that materials and equipment required for work will be onsite.

b. Contractor will be prepared to perform work on date and during period of time requested for specific interruption of service.

3. Allowable time and available interruption of service periods will govern interruption of service requests, work scheduling, onsite delivery of materials, and required drawings and data submittals.

B. When work cannot be performed during an approved interruption of service period, notify COR that interruption of service is not required.

C. Show construction interruption of services greater than 4 hours in the construction schedule.

D. No interruption of water flow to the Leavenworth National Fish Hatchery, see Section 01 14 12 – Work Restrictions.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 31 19
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 31 19-1, Progress Review Meeting Agenda and Minutes:

1. Includes the following:

a. Meeting shall be held weekly at the work site project office.

b. Prepare agenda and distribute 24 hours before the meeting.

c. Prepare and distribute meeting minutes.

d. Attendees: Responsible representatives who have been fully informed of specifications with respect to technical requirements, and coordination necessary to complete construction. Representatives shall be determined on an as needed basis and typically should include:

1) Project Manager from Contractor.

2) Field Superintendent from Contractor.

3) COR and other Representatives from Bureau of Reclamation.

4) United States Fish and Wildlife Service staff and others identified by the COR.

5) Representatives may attend by telephone and / or video conference.

e. Purpose:

1) Review, schedule, construction progress, and coordination.

a) Review submittals register, submittals currently in review and approval, and meeting submittals due dates or delivery time frames.

b) Review safety, security, environmental, schedule, project issues and concerns, submittals, contractor Requests for

Information (RFI), Requests for Proposals (RFP), pending Contract Modifications, and other project related items.

c) Provide 3 week look-ahead schedule at least 2 hours before start of meeting.

d) Review as-built drawings.

e) Provide meeting minutes from the previous weekly meeting.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 31 30
CONTRACT DOCUMENT MANAGEMENT SYSTEM

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Contract Document Management System:

1. Payment: Lump sum price offered in the Price Schedule.

1.02 DEFINITIONS

A. CDMS: Contract Document Management System.

1. Contract Documents include, but are not limited to:
   - a. Specifications.
   - b. Contract Drawings.
   - c. Submittals.
   - d. RFCs: Request for Change (Contractor generated document).
   - e. RFIs: Request for Information (Contractor generated document).
   - f. RFPs: Request for Proposal (Reclamation generated document).
   - g. CMs: Contract Modifications.
   - h. Contractor Proposals.
   - i. Value Engineering Proposals.
   - j. Bureau of Reclamation (Reclamation) Inspection Reports.
   - k. Invoices and Progress Payments.
   - l. Contract Schedules.
   - m. Meeting Agendas and Meeting Minutes.
   - n. Letters and Memos.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittals.

B. RSN 01 31 30-1, Approval Data:

1. Documentation of system capabilities.
2. Instructions for system use.

C. RSN 01 31 30-2, Final Data:

1. DVD, CD or other electronic device approved by Government, of documents uploaded to CDMS.

1.04 QUALIFICATIONS

A. System provider: At least 5-years successful performance in providing required services.

1.05 CDMS REQUIREMENTS

A. CDMS shall be capable of generating, storing, tracking, categorizing, and managing Contract Documents.

B. Access:

1. Web-based:

a. Contract Documents are stored and accessed by authorized individuals via an internet site.

b. Compatible with web browsers MS Edge, Apple Safari, Mozilla Firefox, and Google Chrome.

2. Ability to upload Contract Documents and make available for user download in supported file formats, minimum:

a. Portable Document Format (.pdf).

b. MS Word.

c. MS Excel.

d. MS Project.

e. Oracle Primavera P6 Project Manager.

f. Drawing (.dwg).

g. Contract Manager.

3. Allow Contract Documents to be prepared by Contractor or by Government.

a. Preparing organization will control access of documents. See Document Security and Backup paragraph below.

4. Contractor and Government shall each have a project manager for CDMS:

a. Each project manager shall have capabilities to assign users within their organization and to assign user rights which control access to documents based on user class and document type.

b. Each organization shall be capable of defining its access hierarchy.

c. Inclusion of users will be prerogative of organizational project manager.

d. Government shall be able to create and modify project properties (i.e., Contractor, project location, description, proposal amount, project directory, etc.).

5. Email notifications shall be automatically sent to selectable users when new documents are submitted and available for viewing, or alerts are generated. Examples:

a. Updates to project information (e.g., entry of a new submittal);

b. Changes to project information (e.g., approval of a submittal);

c. Alerts (e.g., submittal under review for >15 days without action).

6. Ability to link files. Examples:

a. RFP linked to a CM.

b. Submittal linked to a Specification or Drawing.

C. Reports:

1. CDMS shall generate reports that list and sort documents by status. Examples:

a. Submittals that have been approved.

b. Invoices paid to date.

c. RFIs under review.

2. Generate alerts when documents requiring action approach or exceed allowable time.

3. Generate customizable summary reports; examples include:

a. Submittal Turn-around.

b. RFI Turn-Around.

c. CM Processing Turn-Around.

d. Total CM costs.

e. Total CM Request Exposure.

4. Reports shall be printable, exportable as searchable .pdf or printer friendly HTML, and exportable to Excel, XML, or CSV.

5. Ability to link from an item in a report directly to the item by clicking on it:

a. For example: in a submittal report, clicking on a submittal that is 15-days old takes you directly to information on that submittal.

6. Capable of producing a complete and logically organized set of documents within CDMS in both .pdf and .xml format.

D. Document Security and Backup:

1. SSL encryption for secured data exchange between browser and server (Secure access to documents and information).
2. Allow document access security until authoring party chooses to share it with others:
   a. Show parties that have access to a document.
   b. Extent of document sharing shall be determined by authoring party.
   c. Once documents are shared, track documents so that changes cannot occur without a record of changes.
3. Backup/Archiving to FTP site of documents to which an organization has access on a regular (minimum monthly) basis.
4. Documents shall be downloadable to FTP sites where Government and other organizations can each access their own data confidentially.

E. General Tracking and Control:
1. Documents shall be grouped into categories (Submittals, RFI, RFP, CM, Payments, Daily Inspection Reports, and Meeting Minutes).
2. CDMS shall track:
   a. When documents were received or returned, as well as status of documents (e.g. Under Review; or Returned, Approved or Rejected, etc.).
3. Document changes including who entered or changed document and date change was made.
4. When a reviewer has opened an item.

F. Submittal Tracking and Control:
1. Ability to create master list of submittals (“Schedule of Submittals”.)
2. Customizable standard submittal form for entering information:
   a. Required information includes:
      1) Required submittal number (RSN), title, description, and specification section.
   b. Upload submittal data in electronic format.
3. Track date received, date response due, date returned, and status:
   a. Status designations may be modified to fit Government standard designations – Approved, approved subject to identified changes, or not approved.
4. Supply Submittal Tracking form for Government to enter review comments and action taken. Allow customizing of submittal tracking form:
   a. Allow for Government to route submittal to third parties (e.g., consultant, internal design or operations and maintenance groups, etc.) by generating design-review transmittals with each submittal package item, to track

status of individual sub-items within submittal package, and to route each sub-item to the appropriate reviewers.

5. Ability to generate automatic notification after specified days without response.

G. RFI Tracking and Control:

1. Supply standard RFI form to enter information.
2. Ability to create or attach documents to the RFI form or links to other documents within CDMS.
3. Ability for Government to route RFI to appropriate reviewers and for reviewers to enter comments into standard response form.

H. Inspection Reports Tracking and Control:

1. Ability to attach Reclamation standard inspection and report forms into CDMS and ability to create customizable inspection forms in CDMS. Typical forms:
   a. Daily Inspection Report (DIR).
   b. Survey requests.
   c. Plant inspection reports.
   d. Testing reports.
2. Ability to link or attach photos to forms and link forms to other documents within CDMS.

I. Contract Modifications:

1. Supply standard Contractor Proposal form with ability to attach documents and link to other documents within CDMS.
2. Supply ability to upload Government's standard CM form and RFP forms, or create an acceptable alternative, to enter information.
3. Ability to attach documents to these forms, and link to other documents within CDMS.
4. Ability for Contractor to respond to RFP and CM form with Cost and Time impacts.
5. Ability to track date CM issued and date responded, with automatic notification after specified days without response.

J. Cost Tracking and Payment Request Management:

1. Ability to import payment items cost from a MS Excel spreadsheet.
2. Ability to edit percent complete and payment amount each month. Format to be spreadsheet, e.g. items available for editing at once, rather than needing to edit one item at a time, save, open next item and edit that, etc.

K. Correspondence:

1. Ability to generate letters and memos:
   a. Ability to attach documents to letters and memos, and to reference other documents within CDMS.
   b. Ability to automatically assign sequential numbers to letters and memos.
2. Ability to generate responses to letters and memos:
   a. System automatically generates memo suffixes; e.g., 1st response to Memo 32 to be 32.1, 2nd response to be 32.2, etc.
3. Official correspondence from Reclamation to Contractor shall contain Reclamation's official letterhead and corresponding logos.
4. Ability to generate meeting agendas and meeting minutes and to attach documents to the minutes:
   a. CDMS shall automatically assign sequential meeting numbers.

L. Miscellaneous Tracking and Controls:

1. Ability to generate logs tracking RFIs, CORs, COs, Submittals, Payments, Memos, DIR's, survey requests, plant inspection reports and testing reports.
2. Ability to filter logs based on criteria e.g., for Submittals: Specification Section, Days Out, Status (approved, partially approved, approved subject to identified changes and resubmit, or not approved.); for RFI's: Days out, Status (Open/Closed), Specification Section/Dwg No., and Responsibility/Ball-In-Court.
3. Ability to sort Logs based on a criterion; e.g., for Submittal, Specification Section, Days Out, Status, or other criteria determined by COR.
4. Ability to provide forms to match Reclamation's CM Form and Progress Payment Form or other forms when needed.
5. Ability to track Cost Exposure with links to RFI and CM requests.
6. Ability to measure productivity benchmarks on a project such as computing average review days for RFIs and submittals, categorize CMs, and track total CM percentages by category.
7. Ability for keyword search of documents in database.
8. Ability to allow online Payment Requests (electronic invoicing) by Contractor.

M. Budget and Funding Source Tracking:

1. Ability to enter funding sources and assign contract line items to multiple funding sources.

PART 2 PRODUCTS

A. Commercially available products having the salient characteristics of Parts 1 and 3.

PART 3 EXECUTION

3.01 IMPLEMENTATION

A. CDMS shall be in place and operating before Contractor transmits any Contract Documents to Government, except, Pre-award documents such as signed offers/amendments, RSN 01 31 30-1, Approval Data, RSN I-04 Bonds, and RSN I-08 Liability Insurance:

1. CDMS operation includes COR, or other authorized Government representative, having program control to assign users and user rights to Government personnel to access appropriate areas of the system.

B. Contractor shall input entrees to the Schedule of Submittals before making submittals. Include:

1. RSNs listed in List of Submittals table found in Section 01 33 00 - Submittals.
2. Scheduled submittal date.

C. Contractor shall provide a report of submittal status monthly or as requested by COR. Submittal status report shall be in a table format and include:

1. Required Submittal Number (RSN).
2. Section Title.
3. Submittal Title.
4. Date Submitted.
5. Date of Response.
6. Approval Status (approved, partially approved, approved subject to identified changes and resubmit, or not approved.)
7. Days in Review.
8. Due Date.

D. CDMS shall be operational until final project closeout.

END OF SECTION

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SECTION 01 32 10
CONSTRUCTION PROGRAM

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Costs:

1. Developing Baseline Schedule: Include in lump sum price offered in the Price Schedule for Mobilization and Preparatory Work.
2. Updating and Using Construction Program: Include as part of Contractor's overhead.

1.02 DEFINITIONS

A. Schedule: The Critical Path Method (CPM) of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the project.

B. Project Calendar(s): Cross reference of numerical work days with calendar days. Project calendars serve as the basis for day/date conversion and assign work days and non-workdays.

C. Resources: Equipment, labor or crews, materials, subcontractors, fabricators, manufacturers, and consultants.

D. Out of Sequence Work: An activity that starts before its predecessor activities are completed.

1.03 REFERENCE STANDARDS

A. Associated General Contractors of America (AGC)

1. AGC Manual — Construction Planning and Scheduling Manual, 2015

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

1. Furnish database files in format compatible with Oracle Primavera P6 Professional Project Management.
2. Upon request, provide information and data used to develop and maintain the Construction Program to the CO.

B. RSN 01 32 10-1, Representative Information:

1. Designation of authorized representative to develop and maintain Construction Program. Include resume with training and experience.

C. RSN 01 32 10-2, Baseline Schedule:

1. Include:

a. Construction Program/Schedule database.

b. Definition of project calendars.

c. Primavera layout file (.plf).

d. Primavera file extension (.xer)

e. Gantt chart (Bar chart) for project on 11 by 17-inch print(s) and in portable document format (.pdf).

f. Activity report including logic constraints consisting of predecessors, successors, and constraint dates.

g. Tabular listings of resources and resource limitations used to produce baseline schedule. Correlate resources with schedule assumptions and offered price. Resource listings may be independent of schedule database.

h. Narrative explanation of project schedule development. Include impacts of resource limitations and weather conditions on project schedule development. Include planned number of work hours per day and hours per day for subcontractors.

D. RSN 01 32 10-3, Updated Schedule Reports:

1. This submittal is required for a proper invoice for progress payments in accordance with the clauses at FAR 52.232-27 - Prompt Payment for Construction Contracts. In accordance with subparagraph (a)(i)(A) of the clause at FAR 52.232-27 - Prompt Payment for Construction Contracts, Government disapproval of this submittal will be considered failure of the Contractor to comply with contract requirements and payment due date may be delayed until 14 days after submittal contents are approved.

2. Include:

a. Construction Program database with updated activity and milestone data.

b. Definition of project calendars if revised from baseline calendars.

c. Primavera layout file (.plf).

d. Primavera file extension (.xer)

e. Gantt chart for project on 11 by 17-inch print(s) and in portable document format (.pdf).

f. Narrative report specifically stating status of project.

1) When negative float exists, cite specific actions and conditions which caused "behind schedule" condition and provide proposed course of action to complete the project within the specified delivery time. When float changed from previous month's updated schedule, explain reason for change.

2) List of Contractor-initiated changes to current schedule stating reason for action taken and unresolved issues relating to the Construction Program. Government reserves the right to reject Contractor-initiated changes to current schedule which negatively impact Government action which was initiated on the basis of current schedule.

3) Discuss contract milestones and significant activities that were started, continued, or completed during the update period or scheduled during the next update period.

g. Submittal Register:

1) List submittals as listed in Table 01 33 00A.

2) Update Submittal Register monthly to include submittals and revised submittals. Register fields shall include RSN name and number, date submitted, date of response, status (e.g., approved, not approved, resubmittal required).

3) This register document is separate from scheduling database.

E. RSN 01 32 10-4, Time Impact Analysis:

1. Include:

a. Construction Program database with proposed revised activity and milestone data.

b. Proposed revised schedule due to change or delay. Highlight or list added, changed, or deleted activities.

c. Primavera layout file (.plf).

d. Primavera file extension (.xer)

e. Gantt chart for project on 11 by 17-inch print(s) and in portable document format (.pdf).

f. Narrative report explaining results and conclusions.

1.05 QUALIFICATIONS

A. Representative: Experienced in developing and maintaining construction schedules and knowledgeable of activities and progress on-site to develop and maintain accurate and reliable schedules. Experience shall include scheduling for at least two other projects of comparable complexity and Primavera P6 training offered by certified instructors.

1.06 GENERAL

A. Develop, maintain, and use Construction Program to plan, monitor, evaluate, and report accomplishment of work.

1.07 SCHEDULES

A. Prepare construction schedules using Critical Path Method outlined in AGC Manual. Use a computer software program to perform mathematical analysis of scheduling data.

1. Prepare schedule based on required sequence and interdependence of activities. Logically sequence activities.
2. Prepare detailed activity network for accomplishing required work organized by Work Breakdown Structure (WBS). Utilize WBS in lieu of activity codes for organization of schedule. If activity codes are utilized in addition to WBS, use unique activity code names assigned as project codes rather than global codes.
3. Activities except "Award" shall have predecessor activities and activities except "Contract Complete" shall have successor activities.
4. Meet contract requirements; milestone(s) in accordance with the clause at FAR 52.211-10, Commencement, Prosecution, and Completion of Work; and relevant clauses and specification sections. Include interim milestone dates, Government interface dates, contract completion date, and other time or seasonal constraints specified in contract documents.
5. Include work of subcontractors, Government interfaces, and contract milestones.
6. Schedule activities to occur as early as possible without unwarranted constraints.
7. Adjust Construction Program/schedule for seasonal weather conditions. Provide a narrative explaining the expected weather and plan for incorporation in schedule. Consider work influenced by high or low ambient temperatures or precipitation. Utilize Primavera P6 calendars to depict historical weather days that impact work. Assign weather calendars to work impacted by weather.
8. Reference activities to contract line item number (CLIN) and specification section identified in the Schedule using user-defined fields.
9. Define activities to level of detail resulting in their durations being no greater than 20 workdays.
    a. Durations for administrative activities (e.g., submittals and reviews) fabrication, manufacturing, and typical level of effort activities (e.g., dewatering, storm water management) shall not be subject to workday duration limitation.
10. Include separate activities for submittal preparation and submittal reviews when submittal addresses work that involves significant quantities, long lead times, is on the critical path or near critical path, or as requested by the COR. Assign Government submittal review activities to a seven-day calendar with durations as

specified in Section 01 33 00 - Submittals. Include Required Submittal Number (RSN) in activity description.

11. Include separate activities for fabrication or manufacturing when work involves significant quantities, long lead times, is on the critical path or near critical path, or as requested by the COR

12. Include contract title, contract number, and Contractor's name on transmittal cover sheet and each sheet of Gantt chart.

13. For each activity on Gantt chart, display activity identification number, activity description, planned or original duration, start date, finish date, total float, and calendar identification. Do not display early start and late start fields.

14. Include table of abbreviations used in the schedule, listed and defined alphabetically.

15. Use finish to start logic relationships between activities. Do not utilize start to start, finish to finish, or start to finish logic relationships. Start to start logic may be utilized on start milestones and finish to finish logic may be utilized on finish milestones only. Do not use positive or negative lead or lag times.

16. Use durations in units of whole workdays.

17. Provide best estimate of time required to complete activity considering quantity of work, work conditions, location of work, and planned resources for activity.

18. Equate durations of Government reviews and other identified actions to maximum number of calendar days specified in their respective paragraphs.

19. Establish workday calendar(s) and use these in the schedule to translate activity's workday duration into calendar dates. Use unique calendar names; do not use software default calendar names. Save calendars as project calendars, not global calendars.

B. Baseline Schedule:

1. Represents Contractor's as-planned approach to accomplishing the work. Do not include actual start dates, percent completes, or actual finish dates.

C. Updated Schedule:

1. Meet monthly with COR at Government's project office, by remote meeting, or at a location approved by the COR, to review progress made to end date of progress payment period. Establish dates that activities were started and completed and remaining duration for each activity started but not completed during the period.

   a. Discuss and mutually agree upon changes to the schedule.

   b. Out-of-sequence activities are not allowed. Revise logic to reflect change in work plan.

   c. Finalize updated Construction Program database with mutually agreed upon changes.

2. Following receipt of executed contract modification, incorporate activity data stipulated in modification into current schedule for inclusion in next scheduled progress update. Provide appropriate logic relationships for revised activities.

3. Assign a unique project file name for each schedule update.

1.08 TIME IMPACT ANALYSIS

A. Provide time impact analysis for contract changes (e.g., change order, proposed modification, or value engineering change proposal) to support a claim or request for equitable adjustment to the contract due to delay or accelerated schedule.

B. The CO may use time impact analysis to determine if time extension or reduction to contract milestone dates is justified.

1. Time impact analysis is required for contract changes whether the Contractor's current schedule milestone dates are the same as, earlier than, or later than, those required under the contract.

2. Changes, additions, or deletions to activities; activity durations; activity time frames; or activity predecessors and successors shall not automatically determine that extension or reduction of contract time is warranted or due the Contractor.

3. Time extensions for performance will be considered only to the extent that the Contractor's current scheduled milestone dates exceed contract milestone dates.

C. Float is not for exclusive use by or benefit of either the Government or the Contractor.

D. Prepare a single time impact analysis for modifications issued after Notice to Proceed (NTP) and prior to approval update.

E. Perform time impact analyses using data in most recent approved schedule update prior to change or delay event.

1. Prepare proposed revised schedule and narrative description describing and highlighting changes or delays.

2. Prepare summary comparing results of two schedule analyses: One using current schedule data from last approved updated schedule prior to event requiring analysis, and one using proposed schedule data incorporating changes or delays.

a. Show contract milestones and activities whose periods of performance have shifted as result of change which affects production and manufacture schedules, material orders, construction seasons, and labor and equipment utilization.

b. For activities directly affected by change or delay, include the current and proposed items:

1) Activity description.

2) Types and quantities of major pieces of equipment, principal manpower, and pacing materials (materials that affect activity start, duration, or finish).

3) Activity duration.

4) Narrative containing rationale used in developing the proposed logic relationships and activity data.

c. Data date for impacted schedule used in comparison shall be the same as approved updated schedule data date.

d. Base schedule comparisons on status of work and available float at time the CO directs or proposes change to the work, the Contractor submits a value engineering change proposal, or when a delay occurs as shown in approved updated schedule.

1.09 REVIEW AND EVALUATION

A. Baseline Schedule:

1. Within 21 calendar days after receipt of baseline schedule:

a. COR will approve or not approve proposed baseline schedule.

b. Upon request from the CO, meet with COR for a joint review of proposed baseline schedule.

c. If schedule is not approved, revise and resubmit within 7 calendar days following date of rejection letter.

2. Do not proceed with onsite work, except mobilization and surveying, until baseline schedule has been approved by the Government.

B. Updated schedules:

1. Submit updated Construction Program schedule monthly.

2. Submit updated schedule at least seven days prior to the submission of each invoice request for progress payment.

3. If updated schedule is not approved, revise and resubmit updated schedule within 7 calendar days following date of rejection letter.

4. The COR will schedule pre-submittal meeting with the Contractor's representative each month to review draft updated schedule prior to the Contractor submitting RSN 01 32 10-3, Updated Schedule.

C. Failure to include elements of the work in schedules will not release Contractor from completing required work under the contract.

D. Performance will be evaluated by the Government using approved CPM schedules.

1.10 FAILURE TO COMPLY

A. Failure to comply with requirements of this Section shall be grounds for determination by the CO that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within specified time.

B. The CO may terminate the Contractor's right to proceed with the work, or separable part of it, in accordance with default terms of this contract.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 33 00
SUBMITTALS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 DEFINITIONS

A. Days: Calendar days.

B. Required Submittal Number (RSN): Identifies items to be submitted together as a complete submittal.

C. Submittal Types, as listed in Table 01 33 00A - List of Submittals:

D. A - Approval:

1. Government will respond as to adequacy of submittal.
2. Approval Submittals: Considered “shop drawings” within the terms of the clause at FAR 52.236-21, Specifications and Drawings for Construction.

E. I - Informational:

1. The Government will acknowledge receipt of Informational submittals.
2. The Government may reject an Informational submittal when the submittal does not comply with the contract. The Contractor shall correct mistakes or deficiencies in rejected Informational submittals and resubmit.
3. Informational Submittals: Considered “shop drawings” within the terms of the clause at FAR 52.236-21, Specifications and Drawings for Construction, except that approval by the Government is not required.

F. CDMS: Construction Document Management System.

1.03 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)

1. ASME Y14.1-12 — Decimal Inch Drawing Sheet Size and Format

B. National Institute of Building Sciences (NIBS)

1. NIBS NCS-14 United States National CAD Standards, Version 6

1.04 SUBMITTAL REQUIREMENTS

A. In case of conflict between requirements of this section and requirements included elsewhere in these specifications, requirements included elsewhere take precedence.

B. General:

1. Prepare in English.
2. Label with contract number and title, and RSN.
3. Measurement Units: US Customary Units.

C. Drawings:

1. Minimum Identification in Title Block:
   a. Contract number and title.
   b. Contractor or supplier's title and drawing number.
   c. Date.
2. Reserve 3- by 3-inch space next to title block for review stamps.
3. Print Size: D size (22 inches by 34 inches).
4. Draw to scale using computer drafting or drafting equipment, unless otherwise specified.
   a. Lettering shall be neat when drawing preparation with drafting equipment is allowed.
5. Final Drawings:
   a. Show as-built changes, including revision dates, made during installation. Indicate changes by clouding.
6. Final Electronic Drawings: When final electronic drawings are required;
   a. Drawing format: AUTOCAD, Version 2018 or later, or as approved by the COR.
   b. Compile using 'eTransmit' utility in AutoCAD.
   c. Show as-built changes, including revision dates, made during installation. Indicate changes by clouding.
   d. Electronic files: On CD, DVD discs or other electronic device approved by the Government.
   e. Original plots: D size (22 inches by 34 inches).
   f. Government will provide an electronic AutoCAD template.

D. Product Data:

1. Mark manufacturer's data for commercial products or equipment, such as catalog cut sheets.

   a. Identify manufacturer's name, type, model, size, and characteristics.

   b. Illustrate that product or equipment meets requirements of specifications.

   c. Mark items to be furnished in a manner that will photocopy (no highlighter).

   d. Strike through items that do not apply.

E. Certifications:

1. Certifications by a Registered Professional: Signed and sealed by registered professional.

2. Manufacturer’s Certifications: Signed by authorized representative of manufacturer.

F. Photographs:

1. When requested.

   a. Digital files: In .jpeg or similar format.

G. Samples Submittals:

1. Label with complete manufacturer's product identification.

2. Include type and quantity of materials specified in the referenced section in each “set” of samples.

3. Samples: Representative of product to be installed.

4. Label each sample with contract number and title.

1.05 SUBMITTALS PROCEDURES

A. Submit only checked submittals. Submittals without evidence of Contractor's approval will be returned for resubmission.

B. Submit complete sets of required materials for each RSN as specified in “Submittals Required” column in Table 01 33 00A - List of Submittals. A complete set includes all listed items for RSNs with multiple parts.

C. Include the following information in transmittal letters:

1. Contract number and title.

2. RSN for each attached submittal.

3. Responsible code.

4. Number of sets for each RSN.
5. Identify submittal as initial or resubmittal.

D. Resubmittal of submittals not approved:

1. Mark changes such that they are readily identifiable and show revision date.
2. Describe reasons for significant changes in transmittal letter.
3. Resubmit returned submittals within 28 days after receiving the comments, unless otherwise directed.
4. Requirements for initial submittals apply to resubmittals.

1.06 REVIEW OF SUBMITTALS

A. Time Required:

1. Submittal review will require 28 days for review of each submittal or resubmittal, unless otherwise specified.

B. Time in Excess of Specified:

1. The CO may extend the contract completion date to allow additional time for completing work affected by excess review time.
   a. The time extension will be to the extent that excess review time caused delay to the contract completion date.
   b. The time extension will not exceed the time used in excess of the specified number of days for review of submittals or resubmittals.
2. Concurrent days of excess review time resulting from review of two or more separate submittals or resubmittals will be counted only once in extending the Contract completion date.
3. No time extension will be allowed if the Contractor fails to make complete approval submittals in sequence and within time periods specified.
4. Adjustment for delay will be made only to the extent that:
   a. Approval was required under the contract, and,
   b. Requests for approval were properly and timely submitted and were approved.
5. Adjustment will be subject to terms of paragraphs (b) and (c) of the clause at FAR 52.242-14, Suspension of Work, however, no such delay shall be deemed to be a “suspension order” as the term is used in that clause.

C. Return of Submittals:

1. Approval Submittals: One set of submittals required for approval will be returned either approved, approved with comments, or not approved.

a. Revise and resubmit submittals not approved.

b. Do not change designs without approval of the CO after drawings, documentation, and technical data have been approved.

2. Informational Submittals: The Government will acknowledge Informational submittals.

a. Informational submittals will not be returned when they comply with the specifications.

b. Informational submittals that do not comply with the specifications may be returned for resubmittal or additional information may be requested.

D. Provide the CO with a copy of all correspondence and related documents, pertaining to this contract that it addresses to representatives of the Government. This does not pertain to the Submittal Requirements as they are outlined herein.

1.07 ELECTRONIC TRANSMITTALS

A. Except as noted, transmit electronically through Government supported CDMS Site. Contact information will be provided to the Contractor after award.

B. CDMS submittal shall meet the requirements of Article 1.05 Submittal Procedures.

C. Only one complete set shall be submitted with each CDMS submittal.

D. Each submittal shall be submitted separately.

E. Electronic file size shall not exceed 40 Megabytes (MB). Electronic files in excess of 40 MB must be transmitted as hard copy transmittals on suitable storage medium approved by the Government.

F. Submit data in required format; e.g., survey data ASCII, electronic drawings AutoCAD .dwg.

G. Where format is not specified, preferred format is searchable portable document format (.pdf).

H. The Government, at the discretion of the COR, may require the Contractor to resubmit as hardcopy any transmittals which appear unclear or illegible in their electronic format.

I. Time required for review of each submittal or resubmittal begins on the next business day after transmittal of a complete set and ends the day the response is transmitted.

J. CDMS submittals will be responded to through CDMS.

K. Submittals required by the specifications, but not listed in Table 01 33 00A - List of Submittals:

1. Submit in accordance with this section.
2. Submit to COR, unless otherwise specified.

1.08 HARD COPY TRANSMITTALS

A. Transmit hard copies of transmittals when required by Table 01 33 00A - List of Submittals or these specifications. If there is a conflict between these specifications and Table 01 33 00A - List of Submittals, Table 01 33 00A - List of Submittals shall govern.

B. Addresses for codes listed in Table 01 33 00A - List of Submittals:

1. Contracting Officer (CO), Bureau of Reclamation Contracting Officer, PN-7300, 1150 N. Curtis Road, Boise, ID 83706-1234.
2. Contracting Officer's Representative (COR) Bureau of Reclamation, PN-3500, 1150 N. Curtis Road. Boise, ID 83706-1234.
3. Technical Service Center, Bureau of Reclamation, Attn: 86-68160, P.O. Box 25007, Denver, CO 80225-0007; Express Mail: Sixth and Kipling, Building 67, Room 152.

C. Send original transmittal letter with appropriate number of sets to office listed in "Responsible Code" column in Table 01 33 00A - List of Submittals.

1. Send copy of transmittal letter with appropriate number of sets to offices that are not the responsible code but show "Sets to be sent" in Table 01 33 00A - List of Submittals. When "Sets to be sent" is 0, send a copy of transmittal letter to that office.

D. Time required for review of each submittal or resubmittal begins when complete sets of materials required for a particular RSN are received and extends through return mailing postmark date.

E. Post copy of transmittal letter to Government supported CDMS Site. Government will post copy of response to Government supported CDMS Site.

F. Hard copies of the following are required:

1. Original signed copies of bonds and insurance.
2. Paint samples or color chips.
3. Physical samples.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

Table 01 33 00A – List of Submittals

* Submittal Types: A – Approval, I – Information
** Y indicates Yes, the submittal is required to be shown on the Construction Schedule – see Section 01 32 10 – Construction Program
*** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center

RSN	Clause or Section Title	Submittals required	Due date or Delivery time	Type *	CP **	Respon-sible code	No. of sets to be sent to: ***		
							CO	COR	TSC
I-01	Release of claims (1452.204-70)	Release of claims (DI-137) against United States	After completion of work and prior to final payment	A		CO	1	1	1
I-02	Payroll and Basic Records (52.222-8)	Certified payrolls	Weekly for each week any contract work is performed on site	I		COR	CDMS		
I-03	Labor standards data (52.222-11)	(1) List of subcontractors (2) Statement and Acknowledgment Form (SF-1413) for each subcontract	Within 14 days after award of contract, and within 14 days after award of any subcontract	I		COR	CDMS		
I-04	Bonds (52.222-15)	Performance and payment bonds	Within 10 calendar days after award	A		CO	1	0	0
I-05	Estimate of Percentage of Recovered Material Content of EPA-Designated Items (52.223-9)	Estimate the percentage of the total recovered material content for EPA designated item(s) delivered and/or used in contract performance	On completion of the contract (no later than with submittal of final voucher)	I		COR	CDMS		
I-06	Security Requirements (WBR 1452.237-80)	Security Program	Submitted and approved before mobilization	A	Y	COR	CDMS		
I-07	Security Requirements (WBR 1452.237-80)	List of Onsite Employees	At least 7 days before employee arrival	I		COR	CDMS		
I-08	Liability Insurance (DIAR 1452.228-70)	Acceptable evidence showing that insurance has been obtained	Within 10 calendar days after award	A		CO	1	0	0

Table 01 33 00A – List of Submittals

* Submittal Types: A – Approval, I – Information
** Y indicates Yes, the submittal is required to be shown on the Construction Schedule – see Section 01 32 10 – Construction Program
*** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center

RSN	Clause or Section Title	Submittals required	Due date or Delivery time	Type *	CP **	Respon-sible code	No. of sets to be sent to: ***		
							CO	COR	TSC
01 14 10-1	Use of Site	Land Use and Landscape Rehabilitation Plan	Submitted and approved 28 days before use of government land	A	Y	COR	CDMS		
01 14 10-2	Use of Site	Other Land Use Coordination	Submitted and approved 90 days before use of private land	A	Y	CO	CDMS		
01 14 30-1	Interruption of Services	Interruption of Electrical Services Request	At least 14 days before interruption is scheduled	A	Y	COR	CDMS		
01 31 19-1	Project Management and Coordination	Progress Review Meeting Agenda and Minutes	Weekly	I		COR	CDMS		
01 31 30-1	Contract Document Management System	Approval Data	Within 10 days of Notice of Award	A		COR	CDMS		
01 31 30-2	Contract Document Management System	Final Data	At Closeout	A		COR	CDMS		
01 32 10-1	Construction Program	Representative Information	Within 10 days of Notice of Award	A		COR	CDMS		
01 32 10-2	Construction Program	Baseline Schedule	Within 21 days after receipt of Notice to Proceed	A		COR	CDMS		
01 32 10-3	Construction Program	Updated Schedule Reports	Monthly When invoice for progress payments will be submitted, submit at least 7 days before invoice	A		COR	CDMS		

Table 01 33 00A – List of Submittals

* Submittal Types: A – Approval, I – Information
** Y indicates Yes, the submittal is required to be shown on the Construction Schedule – see Section 01 32 10 – Construction Program
*** CO indicates Contracting Officer, COR indicates Contracting Officer Representative, and TSC indicates Technical Service Center

RSN	Clause or Section Title	Submittals required	Due date or Delivery time	Type *	CP **	Respon-sible code	No. of sets to be sent to: ***		
							CO	COR	TSC
01 32 10-4	Construction Program	Time Impact Analysis	Within 28 days after the CO directs a contract change, or requests proposal for a future modification, with value engineering proposal, or request for equitable adjustment	A		COR	CDMS		
01 35 10-1	Safety Data Sheets	Complete LHM and SDS	At least 14 days before jobsite delivery of hazardous material.	I		COR	CDMS		
01 35 10-2	Safety Data Sheets	Updated LHM and SDS	At least 14 days before jobsite delivery of hazardous material not previously listed	I		COR	CDMS		
01 35 20-1	Safety and Health	Safety and Health Program	Submitted and approved 28 days before start of construction activities	A		COR	CDMS		
01 35 20-2	Safety and Health	Monthly Accident Summary Report	First day of each month. See paragraph 1.22 of RSHS	A		COR	CDMS		
01 35 20-3	Safety and Health	Respirator User Documentation	Submitted and approved 28 days before start of construction activities	A		COR	CDMS		
01 35 20-4	Safety and Health	Crane Operation Certificates	Submitted and approved 28 days before start of crane activities	A		COR	CDMS		

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							CO	COR	TSC
01 35 20-5	Safety and Health	Other Training Certificates	Submitted and approved 28 days before start of construction activities	A		COR	CDMS		
01 35 30-1	Contractor's Onsite Safety and Health Personnel	Qualifications	Submitted and approved 28 days before mobilization	A		COR	CDMS		
01 35 30-2	Contractor's Onsite Safety and Health Personnel	Safety Inspection Reports	Weekly	I		COR	CDMS		
01 46 00-1	Quality Procedures	Contractor's Daily Reports	Weekly	I		COR	CDM0053		
01 46 00-2	Quality Procedures	Quality Control Manager Resume	Submitted and approved 28 days before start of construction activities	A		COR	CDMS		
01 46 00-3	Quality Procedures	Contractor's Quality Testing Plan	Submitted and approved 28 days before start of construction activities	A		COR	CDMS		
01 46 00-4	Quality Procedures	Summary Monthly Test Results	Monthly	I		COR	CDMS		
01 46 20-1	Testing Agency Services	Testing Agency Services Plan	Submitted and approved 28 days before start of construction activities	A		COR	CDMS		
01 55 00-1	Vehicular Access and Parking	Preconstruction Video	Within 2 days of completing video	I		COR	0	1	0

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							CO	COR	TSC
01 55 20-1	Traffic Control	Traffic Control Plan	Submitted and approved 28 days before start of construction activities	A		COR	CDMS		
01 56 10-1	Protection of Existing Utilities and Installations	Plan for Protecting Existing Utilities and Installations	Submitted and approved 28 days before mobilization	A		COR	CDMS		
01 57 20-1	Environmental Controls	Copy of Applicable Air Quality Permit	Submitted and approved 28 days before mobilization	I		COR	CDMS		
01 57 20-2	Environmental Controls	Dust Abatement Plan	Submitted and approved 28 days before mobilization	A		COR	CDMS		
01 57 20-3	Environmental Controls	Noise Reduction Draft Plan	Submitted and approved 28 days before mobilization	A		COR	CDMS		
01 57 20-4	Environmental Controls	Noise Reduction Final Plan	Submitted and approved 28 days before mobilization	A		COR	CDMS		
01 57 20-5	Environmental Controls	Noise Reduction Monitoring	Daily	I		COR	CDMS		
01 57 30-1	Water Pollution Control	Pollution Prevention Plan	At least 90 days before start of construction activities	A	Y	COR	CDMS		
01 57 30-2	Water Pollution Control	Spill Prevention, Control, and Countermeasure (SPCC) Plan	At least 90 days before delivery or storage of oil	A		COR	CDMS		
01 57 50-1	Tree and Plant Protection	Protection Plan	Submitted and approved 28 days before mobilization	A		COR	CDMS		

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							CO	COR	TSC
01 57 70-1	Fire Protection and Prevention	Approved Fire Protection and Prevention Plan	Submitted and approved 28 days before mobilization	A		COR	CDMS		
01 57 90-1	Preservation of Historical and Archeological Data	Proposed Use, Borrow, and Spoil/Waste Areas	At least 90 days before start of construction activities	A		CO	CDMS		
01 61 10	Buy American	Buy American Certificates	At least 28 days prior to project closeout	I		COR	CDMS		
01 71 20-1	Surveying	Surveying Plan	Submitted and approved 28 days before start of surveying activities	A		COR	CDMS		
01 71 20-2	Surveying	Resume	Submitted and approved 28 days before start of surveying activities	I		COR	CDMS		
01 71 20-3	Surveying	Accuracy Check Results	Submitted and approved 28 days before start of surveying activities	I		COR	CDMS		
01 71 20-4	Surveying	Electronic Survey Data Files and Printouts	Within 2 days of completing each set of survey notes	I		COR	CDMS		
01 71 20-5	Surveying	Quantity Survey Notes and Computations	Accompanying progress payment requests	A		COR	CDMS		
01 74 00-1	Cleaning and Waste Management	Waste Production and Disposal Plan	Monthly and within 14 days of completion of work	A		COR	CDMS		
01 74 00-2	Cleaning and Waste Management	Waste Production and Disposal Records	Within 7 days of waste disposal	I		COR	CDMS		

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							CO	COR	TSC
01 74 00-3	Cleaning and Waste Management	Environmental Consultant Resume	Submitted and approved 28 days before mobilization	I		COR	CDMS		
01 74 00-4	Cleaning and Waste Management	Environmental Site Assessment	Within 14 days of completion of construction activities	I		COR	CDMS		
01 78 30-1	Project Record Documents	Draft As-built Drawings	Updated Weekly	A		COR	0	1	1
01 78 30-2	Project Record Documents	Final Drawings	Within 28 days of completion of onsite work	A		COR	0	1	1
01 78 30-3	Project Record Documents	Extra Materials Inventory	Within 28 days of completion of onsite work	A		COR	CDMS		
01 79 20-1	Training	Training Materials	At Commissioning	I		COR	0	2	1
							CDMS		
02 41 10-1	Selective Site Demolition	Demolition Plan	Submitted and approved 28 days before start of demolition and with RSN 03 81 10-1	A		COR 8140	CDMS		
02 80 10-1	General Requirements for Hazardous Materials	Qualifications	Submitted and approved 28 days before start of abatement	A		COR 8540	CDMS		
02 80 10-2	General Requirements for Hazardous Materials	Worker Protection Plan	Submitted and approved 28 days before start of abatement	A		COR 8540	CDMS		

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							CO	COR	TSC
02 80 10-3	General Requirements for Hazardous Materials	Background Test Results	Within 7 days of testing	A		COR 8540	CDMS		
02 80 10-4	General Requirements for Hazardous Materials	Working Level Test Results	Within 1 day of testing	A		COR 8540	CDMS		
02 80 10-5	General Requirements for Hazardous Materials	Post-construction Test Results	Within 7 days of testing	A		COR 8540	CDMS		
02 80 10-6	General Requirements for Hazardous Materials	Asbestos Clearance Test Results	Within 1 day of testing	A		COR 8540	CDMS		
02 82 20-1	Removal and Disposal of Asbestos Containing Materials	Certificates	Submitted and approved 28 days before start of abatement	I		COR 8540	CDMS		
02 82 20-2	Removal and Disposal of Asbestos Containing Materials	Asbestos Inspection	Within 14 days of completing inspection	I		COR 8540	CDMS		
02 82 20-3	Removal and Disposal of Asbestos Containing Materials	Asbestos Contractor History	Submitted and approved 28 days before start of abatement	I		COR 8540	CDMS		
02 82 20-4	Removal and Disposal of Asbestos Containing Materials	Asbestos Hazard Abatement Plan	Submitted and approved 28 days before start of abatement	I		COR 8540	CDMS		

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							CO	COR	TSC
02 82 20-5	Removal and Disposal of Asbestos Containing Materials	Asbestos Notification of Demolition and Renovation	Submitted and approved 28 days before start of abatement	I		COR 8540	CDMS		
02 82 20-6	Removal and Disposal of Asbestos Containing Materials	Certificate of Disposal	Within 28 days of disposal	I		COR 8540	CDMS		
03 11 10-1	Concrete Forming	Formwork Design and Drawings	Submitted and approved 28 days before start of concrete forming	A		COR 8140	CDMS		
03 20 00-1	Concrete Reinforcing	Reinforcement Diagrams and Lists	Submitted and approved 28 days before start of concrete forming	A		COR 8140	CDMS		
03 30 00-1	Cast-in-Place Concrete	Approval Data	Submitted and approved 28 days before placing concrete	A		COR	CDMS		
03 30 00-2	Cast-in-Place Concrete	Concrete Placement Drawings	Submitted and approved 28 days before placing concrete	A		COR 8140	CDMS		
03 30 00-3	Cast-in-Place Concrete	Concrete Placement Schedule	Submitted and approved 28 days before placing concrete	I		COR	CDMS		
03 30 00-4	Cast-in-Place Concrete	Certifications	Submitted and approved 28 days before placing concrete	I		COR	CDMS		
03 30 00-5	Cast-in-Place Concrete	Pre-Placement Inspection Placement Cards	At least 2 days before start of concrete placement	I		COR	CDMS		

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							CO	COR	TSC
03 30 00-6	Cast-in-Place Concrete	Test Reports	Within 1 day of test completion	I		COR	CDMS		
03 48 00-1	Precast Concrete Structures	Certificates, Product Data and Test Reports	At least 90 days before fabrication	I	Y	COR 8150	CDMS		
03 48 00-2	Precast Concrete Structures	Approval Data	At least 90 days before fabrication	A	Y	COR 8150	CDMS		
03 48 00-3	Precast Concrete Structures	Dry-Fit Test	At Factory, prior to shipping to site	I		COR 8150	CDMS		
03 62 20-1	Nonshrink Grout for Equipment and Metalwork	Packaged Nonshrink Grout Data	Submitted and approved 28 days before placing grout	I		COR	CDMS		
03 81 10-1	Concrete Removal and Disposal	Concrete Removal and Disposal Plan	At least 28 days before start of concrete disposal	I		COR	CDMS		
05 50 00-1	Metal Fabrications	Approval Drawings and Data	Submitted and approved 28 days before fabrication or procurement	A		COR 8120	CDMS		
05 50 00-2	Metal Fabrications	Final Drawings	Within 14 days of completion	I		COR 8120	CDMS		
08 31 20-1	Floor Access Hatches	Product Data	Submitted and approved 28 days before installation	A		COR 8120	CDMS		
09 96 20-1	Coatings	Approval Data	Submitted and approved 28 days before coating activities	A		COR 8540	CDMS		

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							CO	COR	TSC
09 96 20-2	Coatings	Final Approval Data	Submitted and approved 28 days before coating activities	A		COR 8540	CDMS		
09 96 20-3	Coatings	Paint Chip Samples	Submitted and approved 28 days before coating activities	A		COR	0	1	1
09 96 20-4	Coatings	Qualifications	Submitted and approved 28 days before coating activities	A		COR 8540	CDMS		
09 96 20-5	Coatings	Quality Control Plan	Submitted and approved 28 days before coating activities	A		COR 8540	CDMS		
09 96 20-6	Coatings	Contractor Quality Testing Report	Within 3 days of Testing	A		COR 8540	CDMS		
13 34 19-1	Prefabricated Metal Building System	Approval Drawings and Data	Submitted and approved 28 days before building procurement	A	Y	COR 8120	CDMS		
26 05 10-1	Conductors and Cables	Approval Data	Submitted and approved 28 days before procurement	A		COR 8430	CDMS		
26 05 10-2	Conductors and Cables	Construction Documentation	Within 14 Days of Installation	A		COR 8430	CDMS		
26 05 26-1	Grounding and Bonding	Approval Data	Submitted and approved 28 days before procurement	A		COR 8430	CDMS		
26 05 26-2	Grounding and Bonding	As-Built Drawings	Within 14 Days of Installation	A		COR 8430	CDMS		

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							CO	COR	TSC
26 05 26-3	Grounding and Bonding	Test Reports	Within 14 Days of Grounding Testing	A		COR 8430	CDMS		
26 05 33-1	Raceways and Boxes	Approval Drawings and Data	Submitted and approved 28 days before procurement	A		COR 8430	CDMS		
26 05 33-2	Raceways and Boxes	As-Built Drawings and Data	Within 14 Days of Installation	A		COR 8430	CDMS		
26 05 80-1	Wiring Checkout and Tests	Test Reports	Within 7 days of Test Completion	A		COR 8430	CDMS		
26 24 20-1	Control Boards	Approval Drawings and Data	Submitted and approved 28 days before procurement	A		COR 8430	CDMS		
26 24 20-2	Control Boards	Check Prints	At same time equipment is shipped to site	A		COR 8430	CDMS		
26 24 20-3	Control Boards	Factory Test Report	Within 14 days of completion of Testing	A		COR 8430	CDMS		
26 24 20-4	Control Boards	Final Drawings	Within 28 days of completion of installation	A		COR 8430	CDMS		
26 24 20-5	Control Boards	Site Acceptance Testing Reports	Within 28 days of test completion	I		COR 8430	CDMS		
26 24 20-6	Control Boards	Operation and Maintenance Instruction Book	Within 28 days of completion of installation	I		COR 8430	CDMS		

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							CO	COR	TSC
31 03 10-1	Diversion and Care of Water During Construction	Plan for Temporary Pumping	Submitted and approved 84 days before start of pumping	A	Y	COR 8140	CDMS		
31 03 33-1	Removal and Control of Water	Removal and Control of Water Plan	Submitted and approved 28 days before start of construction activities	A		COR 8140	CDMS		
31 23 02-1	Compacting Earth Materials	Test Results	Submitted and approved 28 days before start of construction activities	A		COR	CDMS		
31 23 02-2	Compacting Earth Materials	Method Specification Verification	At least 28 days before start of construction activities	A		COR	CDMS		
31 23 11-1	Earthwork for Pipe and Structures	Excavation and Backfill Plan for Control Valve Structure	Submitted and approved 28 days before start control valve structure construction activities	A		COR 8140	CDMS		
31 23 11-2	Earthwork for Pipe and Structures	Excavation and Backfill Plan for Pipeline Trench and Flowmeter Vault	Submitted and approved 28 days before start of pipeline trench or flowmeter vault construction activities	A		COR 8140	CDMS		
31 23 70-1	Controlled Low Strength Material	Approval Data	Submitted and approved 28 days before start of CLSM placement	A		COR 8530	CDMS		
31 23 70-2	Controlled Low Strength Material	Contractor Field Quality Testing Results	Within 1 day of test completion	A		COR 8530	CDMS		

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							CO	COR	TSC
31 25 10-1	Erosion Control	Silt Fence Certifications	Submitted and approved 28 days before placement	A		COR	CDMS		
31 25 10-2	Erosion Control	Straw Certification	Submitted and approved 28 days before placement	A		COR	CDMS		
32 12 00-1	Asphaltic Concrete Repairs	Asphaltic Concrete Repair Plan	Submitted and approved 28 days before placement	A		COR 8530	CDMS		
32 15 10-1	Gravel Surfacing	Certification and Laboratory Test Results	Submitted and approved 28 days before surfacing	A		COR	CDMS		
32 15 10-2	Gravel Surfacing	Geotextile Installation	Submitted and approved 28 days before placing geotextile	I		COR	CDMS		
32 15 10-3	Gravel Surfacing	Geotextile Certification	Submitted and approved 28 days before placing geotextile	A		COR	CDMS		
32 92 20-1	Seeding and Soil Supplements	Seeding Plan	Submitted and approved 28 days before seeding	A		COR 8140	CDMS		
32 92 20-2	Seeding and Soil Supplements	Certifications	Submitted and approved 28 days before seeding	A		COR 8140	CDMS		
33 05 30-1	Equipment Vaults	Control Valve Vault Construction Schedule and Installation Plan	Submitted and approved 90 days before vault fabrication	A	Y	COR 8150	CDMS		

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							CO	COR	TSC
33 05 30-2	Equipment Vaults	Flowmeter Vault Construction Schedule and Installation Plan	Submitted and approved 90 days before vault fabrication	A	Y	COR 8150	CDMS		
33 05 30-3	Equipment Vaults	Approval Drawings	Submitted and approved 90 days before vault fabrication	A		COR 8150	CDMS		
33 05 30-4	Equipment Vaults	Calculations	Submitted and approved 90 days before vault fabrication	A		COR 8150	CDMS		
33 09 12-1	Ultrasonic Flowmeter Systems	Approval Data	Submitted and approved 90 days before procurement	A		COR 8410	CDMS		
33 09 12-2	Ultrasonic Flowmeter Systems	Final Data	At commissioning	I		COR 8410	CDMS		
33 09 12-3	Ultrasonic Flowmeter Systems	Test Reports	Within 3 days of test completion	I		COR 8410	CDMS		
33 11 18-1	HDPE Pressure Pipe	Qualifications	Submitted and approved 90 days before pipe fabrication or procurement	A		COR 8140	CDMS		
33 11 18-2	HDPE Pressure Pipe	Pipe Laying Diagrams	Submitted and approved 90 days before pipe fabrication or procurement	A		COR 8140	CDMS		
33 11 18-3	HDPE Pressure Pipe	Shop Drawings	Submitted and approved 90 days before pipe fabrication or procurement	A		COR 8140	CDMS		

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							CO	COR	TSC
33 11 18-4	HDPE Pressure Pipe	Certification	Submitted and approved 90 days before pipe fabrication or procurement	A		COR 8140	CDMS		
33 11 18-5	HDPE Pressure Pipe	Fusion Procedures	Submitted and approved 90 days before pipe fabrication or procurement	A		COR 8140	CDMS		
33 11 18-6	HDPE Pressure Pipe	Pipe Deflection Measurements	Within 1 day of test completion	A		COR 8140	CDMS		
33 11 18-7	HDPE Pressure Pipe	Heat Fusion Joint Operator Qualifications	Submitted and approved 28 days before pipe installation	A		COR 8140	CDMS		
33 11 18-8	HDPE Pressure Pipe	Flushing and Draining Plan	Submitted and approved 28 days before flushing	A		COR 8140	CDMS		
33 11 18-9	HDPE Pressure Pipe	Filling and Testing Plan	Submitted and approved 28 days before filling and testing	A		COR 8140	CDMS		
33 11 18-10	HDPE Pressure Pipe	Floatation Prevention Plan	Submitted and approved 28 days before installation	A		COR 8140	CDMS		
35 21 95-1	Steel Piping	Shop Drawings	Submitted and approved 42 days before fabrication or procurement	A		COR 8410	CDMS		
35 21 95-2	Steel Piping	Commercial Products Data	Submitted and approved 28 days before fabrication or procurement	A		COR 8410	CDMS		

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							CO	COR	TSC
35 21 95-3	Steel Piping	Pipe Installation Procedure	Submitted and approved 28 days before installation	A		COR 8410	CDMS		
35 21 95-4	Steel Piping	Field Weld Test Results	Within 1 day of test completion	A		COR 8410	CDMS		
35 21 95-5	Steel Piping	Final Drawings	Within 14 days of completion	I		COR 8410	CDMS		
35 22 14-1	Valves and Equipment	Commercial Products Data	Submitted and approved 56 days before fabrication or procurement	A		COR 8410	CDMS		
35 22 14-2	Valves and Equipment	Check Prints – Valve Actuator	At same time equipment is shipped to site	I		COR 8430	CDMS		
35 22 14-3	Valves and Equipment	Shop Testing Certifications and Reports	Within 28 days after testing	A		COR 8410	CDMS		
35 22 14-4	Valves and Equipment	Service Manuals	Within 14 days of completion	I		COR 8410	CDMS		

END OF SECTION

SECTION 01 33 26
ELECTRICAL DRAWINGS AND DATA

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for items of work requiring electrical drawings and data.

1.02 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)

1.	ASME Y14.1-2012	Decimal Inch Drawing Sheet Size and Format

B. Institute of Electrical and Electronic Engineers (IEEE)

1.	IEEE 315-1975(1993)	Graphic Symbols For Electrical and Electronics Diagrams (Including Reference Designation Letters)
2.	IEEE C37.2-2008	Electrical Power System Device Function Numbers, Acronyms, and Contact Designations
3.	IEEE Y32.9-1972(1989)	Graphic Symbols for Electrical Wiring and Layout Diagrams Used in Architecture and Building Construction

C. National Electrical Manufacturers Association (NEMA)

1.	NEMA ICS 1-2000(2015)	Industrial Control and Systems: General Requirements

1.03 SUBMITTAL PROCEDURES

A. In addition to requirements in Section 01 33 00 - Submittals, prepare electrical drawings and data submittals in accordance with the following.

B. Drawings, general:

1. Device designations and symbols:
   a. Conform to IEEE 315, IEEE C37.2, IEEE Y32.9, and NEMA ICS-1.
   b. As indicated on Standard Drawing 104-D-1150 and 104-D-757.

2. Size: D-size prints as defined in ASME Y14.1 made from original drawings.

3. Indicate changes on revised drawings to distinguish them from previous submittals. Describe reasons for significant changes in submittal letters.

C. Approval Drawings In Government Format:

1. General:

a. Furnish with Government title block and in form as indicated on standard drawing 40-D-7102.

b. Government will provide specific title block information when drawings are submitted.

c. Government may revise conductor or device designations on Contractor's drawings when drawings are approved at no change in contract price or completion time.

2. Schematic Diagrams:

a. In accordance with standard drawing 104-D-1150.

b. Format:

1) Vertical ladder diagram form.

2) Label rungs with sequential numbers starting with number 1.

3) Locate rung numbers adjacent and to left of associated rung.

4) Provide unique rung numbers for each circuit.

c. Conductor designations: As indicated on drawings.

d. Indicate device terminal designations.

e. Indicate functional operation.

f. Describe unusual or nonstandard operation.

g. Indicate ratings and/or values of devices.

h. Indicate contacts, including spare contacts, for motor contactors, auxiliary relays, timers, and protective relays.

i. Indicate cross-referencing between other schematic and wiring diagrams.

j. Do not include current and potential transformer circuits on drawing with direct-current control and protective relaying circuits.

k. Conductor designations: As indicated on drawings or as developed by Contractor. Contractor-developed conductor designations shall consist of:

1) Circuit prefix.

2) Rung number.

3) Unique rung wire letter such as 5P15C ("5"-Unit Number, "P"-Protection Circuit, "15"-Rung Number, "C"-Unique Rung Wire Letter).

l. Base instrument current and potential transformer circuit conductor designations upon primary conductor designations indicated on single-line diagram drawings.

m. Show switch developments for control, selector, and limit switches.

n. Show device and terminal block designations.

3. Wiring Diagram Drawings:

a. Match with schematic diagram drawings.

b. Indicate point-to-point wiring in accordance with standard drawing 104-D-1165.

c. Indicate equipment as mounted on back, side, swing, and door panels. Show panel as viewed from wiring side of panel.

d. Identify each item of equipment with designation indicated on schematic diagram.

e. Identify control and protective devices with IEEE device number as indicated on specifications drawings or on Standard Drawing 104-D-1150.

f. Identify components such as fuses and resistors by value.

g. Indicate wiring of devices and items of equipment including terminal number.

h. Indicate cables, cable and individual wire designations, and connections to external circuits.

i. Cable designations: Similar to designations on standard drawing 104-D-1165.

j. Show no more than one panel per drawing.

4. Sample Wiring Diagram: Sample of actual wiring diagram that will be submitted as check print and final drawing.

D. Approval Drawings and Data in Manufacturer's Format:

1. General: Furnish with manufacturer's standard format, except as noted below.

2. Equipment Layout Drawings:

a. Indicate dimensions of equipment.

b. Indicate location of devices and items of equipment including nameplates, terminal blocks, wiring ducts, bus, conduit entries, and other features in their relative physical location.

c. Indicate method of securing equipment to deck, floor, or wall.

d. Identify each device and item of equipment with a bill of material reference number.

3. Bill of Material List:

a. Provide information on manufacturer, style, type, rating, quantity, and other identifying information for each device or item of equipment.

b. Provide unique reference number for each device or item of equipment listed on bill of material.

4. Nameplate Lists: Provide information on type of material, size, and engraved lettering.

5. Manufacturer's Technical Catalog Data:

a. Provide technical data for each device or item of equipment.

b. Include manufacturer's name and address; catalog number, type, style, or model number; electrical ratings; and dimensions.

c. Where several items are listed on same sheet, indicate items being submitted for approval.

d. Demonstrate proposed device or item of equipment meets specifications requirements.

e. Mark catalog data sheet with appropriate bill of material (BOM) item number.

f. Assemble catalog data sheet into one enclosing cover with bill of material (BOM) index.

6. Time-Current Characteristic and Equipment Coordination Curves:

a. Provide time-current characteristic curves for adjustable and non-adjustable protective devices.

b. Provide equipment coordination curves for:

1) Transformer inrush current.

2) Transformer full load current.

3) Transformer thermal and mechanical damage.

4) Motor inrush current.

5) Motor full load current.

c. Original plot on log-log graph paper.

d. Illustrate degree of selectivity being provided.

E. Check Prints:

1. Schematic and wiring diagrams which indicate "As-built" condition of equipment at time of shipment.

2. Mark as changes and revisions are made during installation and checkout of equipment.
3. Keep drawings at the jobsite and mark as work progresses.
4. Maintain separate, identical set of prints for use in preparing final drawings.

F. As-built Drawings:

1. Mark prints of electrical specifications drawings to indicate as-built changes made to equipment and systems during construction.
2. Provide for grounding, conduit, and lighting systems.
   a. Indicate as-built changes made during construction.
   b. Indicate dimensions of:
      1) Location of grounding electrodes.
      2) Embedded and direct buried grounding cables.
      3) Embedded and direct buried conduit.
3. Include revision dates.
4. Mark the drawings in the following colors:
   a. Red - Additions to original drawings.
   b. Green - Deletions to original drawings.
   c. Blue - Notations necessary for explanation of as-built markings.

G. Final Drawings:

1. Revised to reflect approval comments and as-built condition of installed equipment at time of contract completion.
2. Provide original plot of schematic and wiring diagrams, equipment layout drawings, bill of materials, and nameplate drawings/lists.
3. Provide computer drawing files on DVD disc or other electronic device approved by the Government, in AutoCAD (*.dwg).

H. Test Reports:

1. Typed, 8 1/2- by 11-inch sheets.
2. Certified.
3. Submit multi-page reports in bound folder or three-ring binder.

I. Operation and Maintenance Instructions Books:

1. Print copies:
   a. Assemble each set of material into one or more books with enclosing covers.

2. Electronic copies:
   a. Adobe Acrobat (.pdf) format on DVD discs or other electronic device approved by the Government.
   b. Conform to print copies.
   c. Bookmark file(s) to aid in navigating.
3. Provide following items:
   a. Index sheet at front of each book which provides page or index tab number information for each device or item of equipment in book.
   b. Manufacturer's operation and maintenance procedures; installation details, as necessary; and catalog data sheets for each device or item of equipment.
   c. List of recommended spare parts and components.
   d. Parts lists for replacement parts.
   e. Manufacturer's full-size circuit breaker and fuse time-current curves.
   f. Copies of factory test reports.
   g. Copies of bills of materials.
   h. Copies of drawings:
      1) Revised to reflect approval comments.
      2) Maximum size: 11- by 17-inch.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 35 10
SAFETY DATA SHEETS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 DEFINITIONS

A. LHM: List of Hazardous Materials.

B. SDS: Safety Data Sheet.

1. Referred to as Material Safety Data Sheets in the clause at FAR 52.223-3, Hazardous Material Identifications and Material Safety Data - Alternate 1.

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 35 10-1, Complete LHM and SDS.

C. RSN 01 35 10-2, Updated LHM and SDS:

1. Comply with paragraph (e) of clause at FAR 52.223-3, Hazardous Material Identification and Material Safety Data - Alternate 1.

1.04 APPLICATION

A. For the purposes of this contract, “delivered under this contract” in paragraph (b) of the clause at FAR 52.223-3, Hazardous Material Identification and Material Safety Data - Alternate 1, includes:

1. Materials delivered to Government.
2. Materials incorporated into work.
3. Materials used by the Contractor during contract performance at the jobsite.

1.05 DELIVERY

A. Do not deliver hazardous materials to jobsite which are not included on original or previously updated LHM and SDS before receipt of updated LHM and SDS by COR.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 35 20
SAFETY AND HEALTH

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include the cost of complying with this section in the prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. American Conference of Governmental Industrial Hygienists (ACGIH)

1.	ACGIH TLV	Threshold Limit Values. Available at www.acgih.org

B. Bureau of Reclamation (USBR)

1.	RSHS	Reclamation Safety and Health Standards Available on the Internet at: http://www.usbr.gov/safety/rshs/index.html
2.	FIST 1-1-12	Hazardous Energy Control Program. Available on the Internet at: www.usbr.gov/power/data/fist_pub.html

C. Occupational Safety and Health Administration (OSHA)

1.	29 CFR Part 1910	Occupational Safety and Health Standards
2.	29 CFR Part 1926	Safety and Health Regulations for Construction. Available on the Internet at www.osha.gov.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 01 35 20-1, Safety and Health Program:

1. Submit a comprehensive, job-specific safety and health program in accordance with the requirements of Section 1.03 of the Reclamation Safety and Health Standards (RSHS) and these specifications.

2. Cover aspects of on site and applicable off-site operations and activities associated with this contract.

3. Follow the outline in Appendix 1.03 C of the RSHS.

4. The Safety Program will not be accepted for review by the COR unless it addresses, in order, lettered and numbered per Appendix 1.03 C of the RSHS, a comprehensive narrative for each applicable item in the outline and program elements contained in these specifications.

5. Generic company safety programs are not acceptable. The Safety Program must be site specific for this contract.

6. The Contractor's Safety Program must be submitted and accepted by Reclamation prior to commencing onsite work, including mobilization.

7. The Safety Program Statement of Responsibility must state that "the contractor is responsible for ensuring that all work will be in compliance with Reclamation Safety and Health Standards and these specifications".

8. The Safety and Health Program shall include, but not be limited to, the following program elements:

    a. Safety and Health Program Guidance--General Requirements (in accordance with Appendix 1.03 C as per these specifications, Section 01 35 20 1.03.B.4.). Comply with RSHS, local safety programs, and any other referenced safety and health standards. Perform work in accordance with the specific safety program elements and referenced standards. In the site specific safety and health program, address sections that do not apply to this project as 'not applicable'.

        1) Statement of Policy:

            a) Contractor's Safety and Health Policy.

        2) Statement of Safety and Health Responsibilities:

            a) As per this specification RSN 01 35 20-1 listed above.

        3) Statement of Compliance with Regulations, Standards, and Codes:

            a) The contractor shall specifically state the intention to comply with the RSHS, OSHA, and any other regulatory standard. The most stringent shall apply.

        4) Statement of Subcontractor Compliance:

            a) The Contractor shall state that they will ensure compliance of their employees and subcontractors.

        5) Safety Inspection Procedures:

            a) Specify in accordance with this specification and Section 1.03 of the RSHS.

        6) Accident Investigation and Reporting Procedures:

            a) Specify in accordance with this specification and Section 1.22 of the RSHS.

7) Applicable Emergency Plans:

   a) Detail coordination plan for outside emergency services including response time and a site visit where a rescue requires special capabilities or equipment.

   b) This plan shall address detailed emergency contacts and procedures to be used during an onsite emergency.

   c) Additional emergency plans and procedures as applicable to the location and potential hazards such as but not limited to the remoteness of worksite, potential hazards of worksite, and limitations outside assistance.

   d) Plan shall include procedures for weather related emergencies.

8) Confined Space Procedures:

   a) Include a detailed confined space entry plan for operations that require employees to enter confined spaces.

   b) Include engineering controls, personal protective equipment and air monitoring procedures for each confined space.

   c) Include non-entry and entry rescue plan.

   d) Include the contractors Confined Space Program.

   e) This project will require a rescue team on site due to remote location.

9) Lockout/Tagout Procedures:

   a) Include the contractor's written Hazardous Energy Control Program (HECP).

   b) Comply with facility HECP procedures and coordinate activities with Reclamation staff.

10) Electrical Safety:

   a) Include safe work procedures at the site, electrically qualified persons, grounding techniques, use of mobile generators, lighting, power tool safety, and use of personal protective equipment.

   b) Include the use of intrinsically safe equipment or classified hazardous electrical for hazardous atmospheres as needed.

   c) Include controls for hazards such as static electricity as needed.

11) Fire Protection Plans - Hot Work and Fire Prevention:

a) Include a plan to address hazards associated with hot work.

b) Include list of workplace fire hazards, potential ignition sources, safe work procedures, engineering controls and equipment to be used to prevent fires during the hot work process.

c) Type and location of suppression equipment or systems.

d) Offsite assistance agreement.

e) Temporary heating devices.

b. Medical.

1) Facilities:

a) List medical facilities and services, emergency contacts, phone numbers, GPS coordinates, etc. as pertains to worksite and location.

2) Training:

a) All contractor/subcontractor employees on site shall have current First Aid/CPR certifications (unless specified otherwise by the COR). Training shall be in accordance with the American Red Cross or the American Heart Association.

3) Certifications:

a) List required medical certifications for specific tasks such as; crane operator (license requirement), truck driver (CDL), etc.

b) List specific tasks or positions requiring a medical evaluation or medical monitoring.

4) Physician:

a) List physician or medical facility and contact information.

5) Ambulance:

a) Name, location, and telephone number.

6) Physical Qualification of Employees:

a) List specific positions and tasks that may/do have physical requirements and what those requirements are.

7) Records:

a) Proof of successful medical evaluations, etc.

c. Communications.

1) Job Hazard Analysis (JHA):

a) Provide a list of proposed JHA's in the Safety Program for each anticipated work task.

b) A detailed JHA shall be completed onsite prior to starting each work task. Work will not begin on the phase of the work until a JHA is acceptable to the Onsite Government Representative.

c) Activities involving hazardous materials shall have the appropriate Safety Data Sheet(s) attached to the JHA.

2) Employee Training:

a) List training that is required for employees onsite and position specific training in addition to orientation training.

b) Review and include Reclamation required training in the RSHS.

3) Safety Meetings:

a) See Section 1.03 RSHS and this specification.

4) On-site Training:

a) List training that will be provided onsite to employees.

5) Supervisor Training:

a) See Section 1.03 RSHS and this specification.

d. Occupational Health.

1) Procedures and Equipment to Minimize Hazards:

a) Include Procedures used to reduce employee exposures such as but not limited to noise, respiratory, dermal and environmental hazards.

b) Identify respirator users, tasks and operations with recognized respiratory hazards.

c) The plan shall address exposure to respirable silica associated with concrete work as follows:

i. Use of tight-fitting half-face air purifying respirators with P100 cartridges in the absence of an onsite exposure assessment.

d) The level of respiratory protection may only be diminished on the basis of an exposure assessment conducted by a Certified Industrial Hygienist (CIH) specific to each dust generating operation that is acceptable to Reclamation.

e) Hearing Conservation:

i. Include a task- and site-specific hearing conservation plan.

ii. Identify the type of hearing protection and verify that workers are in a Hearing Conservation Program if required.

2) Testing Program for Employees and Work Environments:

a) Include items such as air monitoring, noise monitoring, wipe sampling, etc. as required.

3) Qualified personnel:

a) Identify tasks or positions requiring qualified personnel.

b) Do not list personnel by name in this section (PII).

4) Personal Protective Equipment (PPE):

a) Include a detailed plan for each task that specifies which personal protective equipment shall be used for project activities.

b) The employer must ensure that the PPE is verified by the manufacturer for the intended use and protection.

c) Provide appropriate PPE at no cost to the employees.

5) Ventilation plans.

a) Include detailed plans for ventilation for areas such as confined spaces.

e. Machinery and Mechanical Equipment.

1) Procedures and Equipment to Minimize Hazards:

a) Include testing program for employees and work environments.

b) Include mobile and stationary equipment.

c) Include in the program the requirement in Sections 3.02, 3.03, 3.04 and 3.05 of the RSHS.

d) Reference the appropriate Appendices in the RSHS regarding inspection and testing of equipment during mobilization and prior to start of work.

e) Reference the types of equipment that the contractor intends to use on site and any pertinent requirement that the contractor must meet for inspection, testing, and maintenance of the equipment.

f) List the training and certification requirements that the contractor requires for specific types of equipment (cranes, forklifts, etc.).

2) Inspection Procedures.

3) Maintenance Procedures.

4) Operating Personnel.

5) Protective Safety Devices and Certifications.

6) Elevators and Aerial Lifts.

7) Crane, Hoisting and Rigging Safety:

a) Include operator and rigging safety, materials handling, signaling and communication procedures.

b) All Operators, Riggers and Signalpersons shall be qualified in accordance with OSHA 1926 Subpart CC. Crane Operators shall be certified by an accredited crane operator testing organizations such as NCCCO or equivalent.

c) Reclamation requires an onsite verified load test in accordance with RSHS Appendix F prior to use of cranes.

f. Working Surfaces.

1) Access:

a) Fall Protection and Prevention.

i. Detail safe work procedures, training and engineering controls for work in elevated areas where employees are exposed to a fall.

ii. The Contractor shall use engineered fall protection systems, fall restraint, and/or fall arrest systems for work in elevated areas. Warning line and safety monitoring systems or any combination thereof are not permitted.

b) Rope Supported Work:

i. Include a plan for rope-supported work activities.

ii. Climbing team shall consist of at least 3 qualified workers.

c) Ladders.

d) Platforms, stairways, and ramps.

2) Scaffolding Safety and Design:

a) Include a scaffolding plan indicating what type of scaffolding will be used at the site and provide drawings,

design specifications, manufacturer information, fall protection procedures and falling object protection.

b) Prepared or reviewed and signed by a qualified Professional Engineer (P.E.) except when manufactured systems and standard designs are used.

3) Safety Nets.

g. Electrical Facilities.

1) Substations.

h. Additional Requirements.

1) Hazard Communication:

a) Include a written Hazard Communication plan.

b) The safety and health practices, procedures, and protective equipment used for new and existing products shall be based upon the health hazards identified in the SDS.

2) Personal Protective Equipment (PPE) and Clothing:

a) Include a detailed plan for each task that specifies which personal protective equipment shall be used for all project activities (PPE Hazard Assessment).

b) Class II High Visibility Vests shall be worn on all BOR projects by all personnel onsite.

c) Head Protection and Foot Protection is required on all BOR projects by all personnel onsite.

d) The employer must ensure that the PPE is verified by the manufacturer for the intended use and protection.

e) Provide appropriate PPE at no cost to the employees.

C. RSN 01 35 20-2, Monthly Accident Summary Report:

1. Form 7-2218 or other acceptable form in accordance with Appendix 1.03B of RSHS.

2. Submit on the first day of every month.

D. RSN 01 35 20-3, Respirator User Documentation.

1. Submit documentation of medical provider clearance less than 12 months old for all respirator users at the site. Do not submit pulmonary function tests.

2. Submit results of fit tests less than 12 months old for all users of tight-fitting negative pressure respirators at the site.

E. RSN 01 35 20-4, Crane Operation Certificates.

1. Qualifications for all riggers and signalpersons.
2. Crane Operator Qualifications:
   a. Certifications for all crane and hoist operators.
   b. Medical Qualifications to operate a crane in accordance with RSHS Section 3.04.
   c. Annual crane inspection certifications. Inspected by a third party qualified crane inspector.

F. RSN 01 35 20-5, Other Training Certificates.

1. First Aid/CPR certifications for Contractor's onsite safety representative. Training shall be in accordance with the American Red Cross or the American Heart Association.
2. Proof of fall protection and prevention training for employees who work in elevated areas.
3. Fall protection certificates for anyone working at height, more than 4 feet above floor.
4. Proof of lockout/tagout training for all employees who will work in any area protected by lockout/tagout and hazardous energy control procedures.
5. Proof of training for all Contractor employees involved with confined space entry work.
6. Rope-supported work training certificates for Contractor rope team if applicable. Training shall be in accordance with RSHS Section 1.14.
7. Training certifications and experience for scaffolding competent person if applicable.

1.04 SAFETY AND HEALTH

A. Comply with RSHS, local safety programs, and any other referenced safety and health standards. Perform work in accordance with the specific safety program elements and referenced standards.

B. Provide and maintain a work environment and procedures that will:

1. Safeguard the public, Government personnel, and Contractor employees from Contractor operations and activities that are unsanitary, hazardous, or dangerous to health and safety.

C. Comply specifically with all requirements contained in RSHS Section 1.03-Contractor Requirements.

D. Do not begin on-site work, including mobilization, until the COR accepts the Safety Program.

E. Investigate and submit reports (Form 7-2077) of all accidents, incidents and near misses in accordance with RSHS Section 1.03A within 3 working days of incident.

F. When the Contractor fails or refuses to promptly correct a compliance directive, the Contracting Officer may issue an order to stop all or any part of the work.

1. When satisfactory corrective action is taken, an order to resume work will be issued.

2. The Contractor shall not be entitled to extension of time or to claim for damage or to additional compensation by reason of either the directive or the stop order.

3. Failure of the Contracting Officer to order discontinuance of any or all of the Contractor's operations shall not relieve the Contractor of the responsibility for the safety of personnel and property.

G. Disputes regarding safety and health issues will be settled in accordance with RSHS Section 1.03.

H. The Contractor shall be responsible for providing medical and emergency assistance in a timely manner that is consistent with recognized emergency protocols.

1. In instances where local emergency responders are not readily available, the responsibility to provide emergency services shall default back to the Contractor.

I. The Contractor shall be responsible for ensuring that Subcontractors comply with the requirements set forth in this specification, written programs, the regulatory standards and the industry standards incorporated by reference in the RSHS and OSHA standards.

J. Where there is conflict between the standards, the more stringent or restrictive shall be utilized.

K. The Contractor shall fully participate in the Contractor Safety Program Review meeting, according to RSHS Section 1.03.C. The Contractor Safety Program Review meeting will take place before the start of work.

1. Include subcontractor management representatives.

2. The Safety Personnel shall be present, in order to discuss in detail the Safety Program and Plans.

3. The COR, the Contractor's principal onsite representative, and designated members of respective staffs must participate in the scheduled monthly safety meeting (JPSM) according to RSHS Section 1.03.C.

L. The minimum work crew at any time on the work site shall consist of no less than two people.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

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SECTION 01 35 30
CONTRACTOR'S ONSITE SAFETY AND HEALTH PERSONNEL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. Bureau of Reclamation (Reclamation)

1. RSHS — Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/safety/rshs/index.html

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittals.

B. RSN 01 35 30-1, Qualifications:

1. Contractor's Onsite Safety Representative.
   a. Current first aid and CPR certification.
2. Certified Industrial Hygienist (CIH) for Asbestos Abatement Operations Only.
   a. CIH is required only if material tests positive for asbestos, see Section 02 82 20 - Removal and Disposal of Asbestos Containing Materials.

C. RSN 01 35 30-2, Safety Inspection Reports:

1. Prepare detailed weekly and activity specific, when necessary, safety inspection reports listing noted deficiencies, digital photos, abatement dates and follow-up action for all jobsite activities.
2. Base inspection report on findings of jobsite walk-through with Government personnel and observation of specific activities, when necessary.

1.04 QUALIFICATIONS

A. Contractor's Onsite Safety Representative:

1. Competent supervisory employee with safety and health related training, experience and duties on similar construction products. Certification indicating

completed OSHA authorized 30 hour course for construction. Course shall be completed within last 5 years.

2. Include resume, description of safety representative responsibilities on similar construction projects, and copies of training certifications of the individual proposed as the onsite safety representative.

3. The safety representative shall be acceptable to the COR and can have other duties.

B. Certified Industrial Hygienist (CIH):

1. The Contractor shall identify an individual meeting the requirements training and experience requirements of Article 1.04.A and:

   a. Certified by the American Board of Industrial Hygiene.

   b. Trained in recognizing complex safety, occupational health, and environmental issues.

   c. Knowledgeable of current safety trends, industry practices, and can exercise technical expertise.

   d. Demonstrates professional level knowledge of exposure hazards associated with the specific construction activities and can provide best practices on mitigation and/or controls.

2. Include resume with current telephone numbers of references, description of CIH responsibilities, and copies of training certifications and registration.

1.05 APPLICATION

A. Contractor's Onsite Safety Representative authorities, duties, and responsibilities:

1. Responsible for effectively implementing the Contractor's Safety Program.

2. Coordinate all emergency response activities.

3. Recommend controls for observed hazards or predicted hazards

4. Full authorization to correct unsafe acts on the spot, including the authority to stop work to correct safety and health problems.

5. Lead weekly safety meetings at the jobsite.

6. Onsite, during any and all construction activities.

7. Assemble, review, and sign each Job Hazard Analysis (JHA).

8. Verify the correct use of respiratory protection and personal protective equipment.

9. Conduct and prepare weekly safety inspections in conjunction with the onsite government representative listing noted deficiencies, their abatement dates, and follow up action. The report shall be available for review onsite.

10. Provide direct oversight and assemble a detailed report of all incident reviews, near-misses, accidents, and emergency response or rescue actions.

11. Attend the Safety Program Review Meeting and Conduct the monthly Joint Safety Policy Meetings in accordance with the RSHS section 1.03.

12. The Onsite Safety Representative may have other non-safety duties.

B. Certified Industrial Hygienist (CIH) Duties are for Asbestos Abatement activities only:

1. CIH duties include, but are not limited to:

a. Establish work place exposure assessments in accordance with Federal, State, and local regulations and standard industrial hygiene practices to ensure personnel exposures are below regulated levels.

b. Review and sign the Written Compliance Program for Worker Protection, Containment System Plan, Waste Characterization, Handling, and Disposal Plan, Asbestos Test Results, Working Level Test Results, Post-Construction Test Results, and Certificate of disposal.

c. Visit the site during start-up of Asbestos Abatement activities and a minimum of one time during abatement to confirm that the work is being performed in accordance with the submitted plans and regulations.

d. Full authorization to correct unsafe acts, stop work, prevent exposures, control contamination, engineering controls and containment failures.

e. Exposure assessments to select or verify personal protective equipment or respiratory protection.

f. Prepare detailed weekly CIH inspection reports in accordance with RSN 01 35 30-2.

g. Attend the Safety Program Review Meeting in accordance with the RSHS Section 1.03.

1.06 QUALITY ASSURANCE

A. Contractor's Onsite Safety Representative:

1. The effectiveness of the Contractor's Onsite Safety Representative in prosecuting the safety program will be subject to continued review and approval by the COR.

2. Should the Contractor's safety effort be considered inadequate, the CO has the option to require the Contractor to replace the full-time qualified Safety and Health Professional, at no additional cost to the Government.

B. Certified Industrial Hygienist:

1. The effectiveness of the Contractor's Onsite CIH in prosecuting the Asbestos Abatement activities will be subject to continued review and approval by the COR.

2. Should the Contractor's CIH effort be deemed insufficient the Contractor may be required to provide the services of another qualified CIH during asbestos abatement related activities at no additional cost to the Government.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 42 10
REFERENCE STANDARDS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. Referenced editions of standard specifications, codes, and manuals form a part of this specification to the extent referenced.

B. These specifications take precedence when conflicting requirements occur between specifications and referenced standard.

1.03 JOBSITE REFERENCE STANDARDS

A. Maintain at fabrication site, a copy of referenced standard specifications, codes, and manuals required for work in progress at fabrication site. Make available for use by the Government.

B. Maintain onsite, a copy of referenced standard specifications, codes, and manuals required for onsite work in progress. Make available for use by the Government.

1.04 AVAILABILITY

A. Code of Federal Regulation (CFR):

1. Available online, authorized by the National Archives and Records Administration (NARA) and the Government Printing Office (GPO), at https://www.govinfo.gov/help/cfr.

B. Bureau of Reclamation Documents:

1. Reclamation Safety and Health Standards (RSHS) may be downloaded at http://www.usbr.gov/safety/rshs/index.html.
2. Bureau of Reclamation Standard Specifications are designated with an M-number. Copies of individual standards may be obtained from Bureau of Reclamation, Attn. 86-68160, P.O. Box 25007, Denver, CO 80225-0007. Specify which standard(s) is needed when requesting a copy.
3. Bureau of Reclamation manuals and other publications including significant scientific, technical, and engineering works are available from the National

Technical Information Service (NTIS). Information regarding availability and pricing may be obtained by contacting NTIS at the following address:

United States Department of Commerce
National Technical Information Service
5301 Shawnee Road
Alexandria, VA 22312
Telephone: 1-800-363-2068 or 703-605-6060

C. Industrial and Governmental Documents:

1. When a reference has a joint designation (e.g. ANSI/IEEE) these specifications generally cite the proponent organization (e.g. IEEE).

2. Addresses for obtaining industrial and governmental (other than Federal and Reclamation specifications and standards) specifications, standards, and codes are listed in Table 01 42 10A - Addresses for Specifications, Standards, and Codes.

Table 01 42 10A - Addresses for Specifications, Standards, and Codes

Acronym	Name and Address	Telephone
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street NW, Suite 249 Washington, DC 20001 www.transportation.org	202-624-5800 800-231-3475
ACI	American Concrete Institute 38800 Country Club Drive Farmington Hills, MI 48331 www.concrete.org	248-848-3700
AGC	Associated General Contractors of America 2300 Wilson Boulevard, Suite 300 Arlington, VA 22201 www.agc.org	703-548-3118
ACGIH	American Conference of Governmental Industrial Hygienists 3640 Park 42 Drive Cincinnati, OH 45241 www.wcgih.org	513-742-2020
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 700 Chicago, IL 60601-1802 www.aisc.org	312-670-2400

Table 01 42 10A - Addresses for Specifications, Standards, and Codes

Acronym	Name and Address	Telephone
ANSI	American National Standards Institute 1819 L Street NW, 11th Floor Washington, DC 20036 www.ansi.org	202-293-8020
APA	APA-The Engineered Wood Association 7011 South 19th Street Tacoma, WA 98466 www.apawood.org	253-565-6600
ASME	American Society of Mechanical Engineers Two Park Avenue New York, NY 10016-5990 www.asme.org	800-843-2763
ASTM	ASTM International P.O. Box C700 100 Barr Harbor Drive West Conshohocken, PA 19428-2959 www.astm.org	877-909-2786
AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, CO 80235-3098 www.awwa.org	303-794-7711
AWS	American Welding Society 8669 NW 36 Street, #130 Miami, FL 33166-6672 www.aws.org	800-443-9353 305-443-9353
ICC	International Code Council 500 New Jersey Avenue NW, 6th Floor Washington DC, 20001 www.iccsafe.org	888-422-7233
ICEA	Insulated Cable Engineers Association P.O. Box 2694 Alpharetta, GA 30023 www.icea.net	800-447-3352
ICRI	International Concrete Repair Institute 1000 Westgate Drive, Suite 252 St. Paul, MN 55114 www.icri.org	651-366-6095

Table 01 42 10A - Addresses for Specifications, Standards, and Codes

Acronym	Name and Address	Telephone
IEC	International Electrotechnical Commission 446 Main Street, 16th Floor Worcester, MA 01608 www.iec.ch	508-755-5663
IEEE	Institute of Electrical and Electronics Engineers 3 Park Avenue, 17th Floor New York, NY 10016-5997 www.ieee.org	212-419-7900
ISA	International Society of Automation PO Box 12277 Research Triangle Park, NC 27709 www.isa.org	919-549-8411
ISO	International Organization for Standardization 1, ch. de la Voie-Creuse, Case postale 56 CH-1211 Geneva 20, Switzerland www.iso.org	41 22 749 01 11
MSS	Manufacturers Standardization Society 127 Park St. NE Vienna, VA, 22180-4602 www.msshq.org	703-281-6613
NAAMM	National Association of Architectural Metal Manufacturers 800 Roosevelt Rd. Bldg. C, Suite 312 Glen Ellyn, IL 60137 www.naamm.org	(630) 942-6591
NACE	AMPP: Association for Material Protection and Performance (formerly known as NACE International) www.ampp.org	281-228-6200
NAPF	National Association of Pipe Fabricators 8521 N. Edison #7 Portland, OR 97203 www.napf.com	903-283-3235

Table 01 42 10A - Addresses for Specifications, Standards, and Codes

Acronym	Name and Address	Telephone
NEMA	National Electrical Manufacturers Association 1300 North 17th Street, Suite 1847 Rosslyn, VA 22209 www.nema.org	703-841-3200
NETA	InterNational Electrical Testing Association 3050 Old Centre Avenue, Suite 102 Portage, MI 49024 www.netaworld.org	269-488-6382
NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101 www.nfpa.org	800-344-3555 617-770-3000
NIBS	National Institute of Building Sciences 2121 K Street NW Suite 800 Washington, DC 20037 www.nibs.org	202-289-7800
NMFS	National Marine Fisheries Service NOAA Fisheries 1315 East-West Highway Silver Spring, MD 20910 www.fisheries.noaa.gov	301-427-8000
NPCA	National Precast Concrete Association 10333 N. Meridian Street, Suite 272 Indianapolis, IN 46290 www.precast.org	317-571 9500
OSHA	U.S. Department of Labor Occupational Safety & Health Administration 200 Constitution Avenue, NW Washington, DC 20210 www.osha.gov	(800)-321-OSHA (800)-321-6742
SSPC	AMPP: Association for Material Protection and Performance SSPC merged with NACE International) NACE is now AMPP. www.ampp.org/home	800-837-8303 412-281-2331

Table 01 42 10A - Addresses for Specifications, Standards, and Codes

Acronym	Name and Address	Telephone
TIA	Telecommunications Industry Association 1320 North Courthouse Road, Suite 200 Arlington, VA 22201 www.tiaonline.org	703-907-7700
UL	Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062-2096 www.ul.com	847-272-8800
WDFW	Washington Department of Fish and Wildlife 1111 Washington St. SE Olympia, WA 98501 www.wdfw.wa.gov	360-902-2200
WWPA	Western Wood Products Association 1500 SW First Avenue, Suite 870 Portland, OR 97201 www.wwpa.org	503-224-3930

PART 1 PRODUCTS

Not Used

PART 2 EXECUTION

Not Used

END OF SECTION

SECTION 01 46 00
QUALITY PROCEDURES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 DEFINITIONS

A. Government Contract Quality Assurance: (from FAR 46.101) Various functions, including inspection, performed by the Government to determine whether a contractor has fulfilled the contract obligations pertaining to quality and quantity.

B. Contractor Quality Assurance / Quality Control (QA/QC): Activities performed by the Contractor to ensure work conforms to contract requirements.

1. The clause at FAR 52.246-12 - Inspection of Construction, requires the Contractor to establish an inspection system to ensure quality.
2. Contractor QA/QC includes activities in addition to specified Contractor Quality Testing to ensure work conforms to contract requirements.

C. Contractor Quality Testing: Specified tests shall be performed by the Contractor.

1. The Government will evaluate results of these tests when determining acceptability of work.
2. The Contractor may use the test results as part of Contractor QA/QC.
   a. The Government anticipates that these tests will be part of the Contractor's QA/QC program, however the tests do not relieve the Contractor of maintaining adequate quality system in accordance with the clause at FAR 52.246-12 - Inspection of Construction.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 01 46 00-1, Contractor's Daily Reports:

1. Submit daily reports on a weekly basis.
   a. Include Test Results.
2. As a minimum, the Contractor's Daily Report shall include the following information:

a. The report shall state specific safety violations noted during the shift including actions taken, including names of people involved in the infraction and who corrected it.

b. The report shall include the temperature (maximum/minimum), wind conditions, estimated humidity, sunshine, and precipitation (type and intensity), if necessary for the type of work being performed. The name of the contractor's representative on the site during the shift shall be noted, and if the representative is on the site part time.

c. The main body of the report shall contain the location and a detailed description of all work, and sketches or photographs where appropriate to assist in the description. The report shall provide a record of quantities installed, specific stations or locations of the work, and description by CPM program activity (if applicable).

3. The report shall contain a list of materials and equipment delivered to the job, what materials were installed, and any materials that were refused or wasted during the shift. Other items to be reported include changes in site conditions, modifications in design and installation, photographs taken, environmental compliance or noncompliance, hazardous waste and materials concerns, landowner contacts, worker complaints, and potential problems observed.

C. RSN 01 46 00-2, Quality Control Manager Resume:

1. Designation of authorized individual as the Quality Control Manager to develop and manage the quality control processes.

2. Resume of the designated Quality Control Manager.

D. RSN 01 46 00-3, Contractor’s Quality Testing Plan:

1. Address methods, procedures, frequencies, and scheduling for performing quality testing as required in other specification sections.

E. RSN 01 46 00-4, Summary Monthly Test Results.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 46 20
TESTING AGENCY SERVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for items of work requiring applicable testing agency services.

B. Progress Payments: If test reports are not submitted in a timely manner, the Contractor will be considered to be in non-compliance and delaying that phase of the work to which the testing applies. The CO may retain appropriate amounts of applicable progress payments.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1.	ASTM C1077-15a	Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Agency Evaluation
2.	ASTM E329-14a	Agencies Engaged in the Construction Inspection, Testing, or Special Inspection
3.	ASTM E543-15	Agencies Performing Nondestructive Testing

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 46 20-1, Testing Agency Services Plan:

1. Include:
   a. Names of agencies to perform sampling and testing.
   b. Agency accreditation to perform specified testing or agency qualifications to perform specified testing.
   c. Resumes of personnel performing tests.
   d. Samples of report forms.
2. No change in the approved plan may be made without written concurrence by the COR.

1.04 QUALIFICATIONS

A. Testing Agency Organization:

1. Agencies testing construction materials: Meet requirements of ASTM E329.
2. Agencies testing concrete and concrete aggregates: Meet requirements of ASTM C1077.
3. Agencies testing soil and rock: Meet requirements of ASTM D3740.
4. Agencies testing bituminous paving materials: Meet requirements of ASTM D3666.
5. Agencies engaged in nondestructive testing: Meet requirements of ASTM E543.

B. Equipment: Calibrate measuring devices, laboratory equipment, and instruments at established intervals.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CONTRACTOR QUALITY TESTING

A. Employ accredited independent agency to perform sampling, testing, and reporting as required in the applicable specification sections.

3.02 QUALITY ASSURANCE

A. During the course of the work, the Government may perform quality assurance tests. Tests performed by the Government will be used to ensure compliance with contract requirements and not as a replacement for specified Contractor quality testing.

END OF SECTION

SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE C2 National Electrical Safety Code (NESC)

1.03 TEMPORARY ELECTRICITY

A. Provide electric power required for construction. Construction power is not available onsite.

B. Provide generators, transmission lines, distribution circuits, transformers, and other electrical equipment and facilities required for obtaining power and distributing power to points of use.

C. Comply with IEEE C2 clearances and spacing for temporary communications and supply lines.

1.04 TEMPORARY WATER

A. Construction water shall not come from Icicle Creek, nor shall it be discharged directly to Icicle Creek, onto project lands, or to the Leavenworth National Fish Hatchery.

B. Construction water will be available onsite:

1. Make arrangements with COR for use of water.
2. Government will designate locations from which water may be obtained.
3. No charge will be made for water obtained from this source.

C. Provide potable water for Contractor's on-site employees.

D. Use water which meets specified requirements for water used in concrete, soil-cement, grouting, and other permanent work.

E. Provide means of conveying water to points of use.

1.05 TELEPHONE

A. Cellular telephone service is sporadic on the site.

B. Obtain hard wired service from local provider.

1.06 PORTABLE TOILET FACILITIES

A. Provide portable toilet facilities with hand washing stations for construction workers.

1.07 AIR

A. Provide compressed air and equipment.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 REMOVAL

A. Remove temporary equipment and facilities upon completion of work under this contract.

END OF SECTION

SECTION 01 55 00
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 REGULATORY REQUIREMENTS

A. Meet requirements established by jurisdictional authority for use of existing roadways and haul routes; including seasonal or other limitations or restrictions, payment of excess size and weight fees, and posting of bonds conditioned upon repair of damage.

B. Comply with applicable regulations for haul routes over public highways, roads, and bridges.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 01 55 00-1, Preconstruction Video.

1. Includes:

a. Contractor Use and Staging Areas.

1) See paragraph 3.02 of this section.

1.04 SITE CONDITIONS

A. Rights-of-way for access to work from existing roads will be established by the Government:

1. In accordance with the clause at FAR 52.236-10, Operations and Storage Areas, use only established roadways, parking areas, and haul routes; or temporary roadways, parking areas, or haul routes constructed by the Contractor when and as authorized by the COR.

2. Subject to the clause at FAR 52.249-10, Default (Fixed-Price Construction), unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of time for completion of work.

B. Access on and off of highway is limited. Provide vehicular access safety in accordance with Section 01 55 20 - Traffic Control.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials to maintain and repair existing roadways, parking areas, and haul routes: In accordance with requirements of jurisdictional authority.

B. Materials to construct, maintain, and repair temporary roadways, parking areas, and haul routes: As approved by the COR.

C. Materials to maintain roadways and parking areas constructed under this contract and used by the Contractor for construction work: In accordance with specified requirements for construction of those roadways and parking areas.

PART 3 EXECUTION

3.01 EXAMINATION

A. Investigate condition of available public or private roads for clearances, restrictions, bridge-load limits, bond requirements, and other limitations that affect or may affect access and transportation operations to and from the jobsite.

3.02 VIDEO RECORDS

A. Make preconstruction video of surface conditions of roads that will be using during construction for haul routes, disposal areas, parking areas, and other uses.

1. DVD format or other electronic device approved by the Government.
2. Label:
   a. Contract number and title.
   b. Contractor's name.
   c. Date the video is made.
   d. Preface video with this information.

B. Make camera movement speed for video such that areas can be readily identified and located as approved by COR.

C. COR will be present during preconstruction videoing.

D. COR will determine the limits of areas to be videoed.

E. Notify COR at least 7 days prior to videoing.

3.03 ESTABLISHED ROADWAYS AND PARKING AREAS

A. Established roadways and parking areas are available for the Contractor's use as shown on the drawings and by approval of the COR.

3.04 TEMPORARY PARKING AREAS

A. Parking Areas:

1. Provide temporary parking areas to accommodate use by construction personnel.
2. Provide additional offsite parking when site space is not adequate.
   a. In accordance with Section 01 14 10 – Use of Site.
3. Locate as shown on drawings or approved by the COR.
4. Contractor is responsible for damage caused by construction operations.

3.05 HAUL ROUTES

A. Perform work on rights-of-way established by the Government as necessary to construct and maintain any roads, bridges, or drainage structures required for establishment and use of haul routes for construction operations.

B. Use existing available public highways, roads, or bridges as haul routes subject to applicable local regulations.

C. Minimize interference with or congestion of local traffic.

D. Provide barricades, flaggers, and other necessary precautions for safety of the public where haul routes cross public highways or roads.

3.06 MAINTENANCE

A. Maintain roadways, parking areas, and haul routes in a sound, smooth condition.

B. Maintain roads and parking areas until completion and acceptance of all work under this contract. As approved by the COR, defer until latest practicable date within specified completion period, placement of surfacing on roads or parking areas subject to heavy and deteriorating use by the Contractor's construction operations or equipment.

C. Maintain surfacing of gravel-surfaced roads and parking areas in a smooth condition until completion and acceptance of all work under this contract.

D. Snow removal for convenience of the Contractor or to facilitate work operations of the Contractor is considered to be normal required maintenance.

3.07 REPAIR

A. Promptly repair ruts, broken pavement, potholes, low areas with standing water, and other deficiencies to maintain road surfacing and drainage in original or specified condition.

B. If COR determines repair is needed during the post construction inspection.

1. COR will mark limits of asphalt to be removed and replaced.
2. Remove existing pavement at least one foot beyond area marked by COR.
3. Repair road with asphalt to match existing pavement type and thickness.

3.08 REMOVAL

A. Remove materials used to construct temporary roadways, parking areas, and haul routes prior to contract completion. Recycle salvageable materials as approved by the COR.

END OF SECTION

SECTION 01 55 20
TRAFFIC CONTROL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. Federal Highway Administration, Department of Transportation

1. MUTCD, Part 6 — Part 6, Temporary Traffic Control, Manual on Uniform Traffic Control Devices, 2009 Edition with Revisions 1 and 2, (http://mutcd.fhwa.dot.gov/kno_2009r1r2.htm)

B. Washington State DOT

1. MUTCD — Washington State Modifications https://app.leg.wa.gov/rcw/default.aspx?cite=47.36&full=true

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 55 20-1, Traffic Control Plan.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 TRAFFIC CONTROL

A. Meet requirements of Washington State DOT.

B. Maximum speed on unpaved roads 10 mph.

C. Provide cones, delineators, concrete safety barriers, barricades, flasher lights, danger signals, signs, temporary fencing, and other temporary traffic control devices as required

to protect work, public safety, pedestrians, and other recreationists on public and private property.

1. Includes access to and within Contractor Use Areas.

D. Provide flaggers and guards as required to prevent accidents and damage or injury to passing traffic and pedestrians.

E. Do not begin work along public or private roads, and parking lots, until traffic control devices for warning, channeling, and protecting motorists are in place in accordance with approved traffic control plan.

F. Maintain vehicle and pedestrian traffic flow and conduct construction operations to minimize obstruction and inconvenience to public traffic.

G. Provide unobstructed, smooth, and dustless passageway for one lane of traffic through construction operations.

H. Maintain convenient access to driveways and buildings along line of work.

I. Protect roads closed to traffic with effective barricades and warning signs. Illuminate barricades and obstructions from sunset to sunrise.

J. Remove traffic control devices when no longer needed.

END OF SECTION

SECTION 01 56 10

PROTECTION OF EXISTING UTILITIES AND INSTALLATIONS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work, except as specified.
2. Costs for repair of installations damaged by the Contractor's operations are the Contractor's responsibility.

1.02 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittals.

B. RSN 01 56 10-1, Plan for Protecting Existing Utilities and Installations:

1. Provide drawing(s) and narrative for protecting existing pipeline and electrical utilities during construction.

1.03 PROJECT CONDITIONS

A. Drawings included in these specifications show items of existing materials and equipment but may not show all equipment and materials existing at the jobsite.

B. Obtain the location of embedded conduit, pipe, cable, ground mat, and other buried items before performing any drilling or cutting of concrete.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 REMOVAL OF PROTECTIVE INSTALLATIONS

A. Remove protective installations after purpose has been served. Materials furnished by the Contractor to provide protection remain property of the Contractor.

3.02 REPAIR

A. Repair, at Contractor's expense, damage to existing installations due to Contractor's operations or Contractor's failure to provide adequate protection. At the Government's option, damage may be repaired by the Government, and the Contractor will be backcharged repair costs.

3.03 INTERFERENCE WITH OPERATION OR MAINTENANCE

A. Do not interfere with operation or maintenance service on utilities that exist on date offers are received. Provide for access to utilities in a manner satisfactory to owners and operators and the Government.

B. Provide required temporary structures; make necessary repairs, replacements, or similar operations; and furnish indemnity or other bonds.

END OF SECTION

SECTION 01 57 20
ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work, except as specified.
2. Costs for damages and work stoppage are the Contractor's responsibility.

1.02 REFERENCE STANDARDS

A. Bureau of Reclamation (Reclamation)

1. RSHS — Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/safety/rshs/index.html

B. Reclamation Project Website:

1. Surface Water Intake Fish Screens and Fish Passage Environmental Impact Statement posted at https://www.usbr.Gov/pn/programs/Leavenworth/swisp/index.html.
2. Surface Water Intake Fish Screens and Fish Passage Resource Reports posted at https://www.usbr.gov/pn/programs/leavenworth/swisp/deis.html

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 57 20-1, Copy of Applicable Air Quality Permit:

1. Air Quality Permits are required for certain construction-related activities including, but not limited to, earthmoving, sandblasting, aggregate processing, welding, spray-coating operations, or other processes which discharge pollutants into the open air.

C. RSN 01 57 20-2, Dust Abatement Plan:

1. Submit Dust Abatement Plan.
   a. Include the following:
      1) See Article 1.05, Dust Control.
      2) Maintain copy of plan onsite.

D. RSN 01 57 20-3, Noise Reduction Draft Plan:

1. Noise reduction measures to minimize construction noise.

a. Includes, but not limited to the following:

1) Noise from pumps, generators, and motors.

2) Equipment noise and motors.

3) General construction activities.

E. RSN 01 57 20-4, Noise Reduction Final Plan:

1. Noise reduction measures to minimize construction noise.

a. Includes, but not limited to the following:

1) Comments from review of RSN 01 57 20-3, Noise Reduction Draft Plan.

a) Includes comments from:

i. USFW.

F. RSN 01 57 20-5, Noise Reduction Monitoring:

1. Includes the following:

a. Perform continuous monitoring of noise at, or in the vicinity, of the following locations, as determined by the COR:

1) USFW.

b. Submit monitoring results to COR daily.

1.04 REGULATORY REQUIREMENTS

A. Comply with Federal, State, and local laws and regulations.

B. Comply with RSHS.

C. Reference the Reclamation Project Website for additional information regarding the Environmental Impact Statement and Resource Reports. See Article 1.02 B.

1. Adherence to the Environmental Impact Statement is required.

D. Conform to most stringent requirement in cases of conflict between specifications, regulatory requirements, and RSHS.

E. Contractor shall be responsible for damages resulting from dust originating from Contractor operations in accordance with clause at FAR 52.236-7, Permits and Responsibilities.

F. The CO may stop construction activity in violation of Federal, State, or local laws and additional expenses resulting from work stoppage will be responsibility of Contractor.

1.05 DUST CONTROL

A. Provide dust control and abatement during performance of work.

1. Water for dust control to be obtained as determined by COR.

a. See Section 01 51 00 – Temporary Utilities, Article 1.04.

B. Prevent, control, and abate dust pollution on rights-of-way provided by Government or elsewhere during performance of work.

C. Provide labor, equipment, and materials, and use efficient methods wherever and whenever required to prevent dust nuisance or damage to persons, property, or recreational activities.

D. Provide means for eliminating atmospheric discharges of dust during mixing, handling, and storing of cement, pozzolan, and concrete aggregate.

1.06 AIR POLLUTION CONTROL

A. Use reasonably available methods and devices to prevent, control, and otherwise minimize atmospheric emissions or discharges of air contaminants.

B. Do not operate equipment and vehicles that show excessive exhaust gas emissions until corrective repairs or adjustments reduce such emissions to acceptable levels.

1.07 NOISE CONTROL

A. Only construction activities approved by COR will be allowed during hours of 7 P.M. to 7 A.M.

B. Daytime Noise Levels:

1. Government will determine the baseline noise levels based on daytime measurements during construction.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 57 30
WATER POLLUTION CONTROL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. Bureau of Reclamation (Reclamation)

1.	RSHS	Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/safety/rshs/index.html

B. Code of Federal Regulations (CFR)

1.	40 CFR, Part 112	Oil Pollution Prevention

C. Public Law

1.	Sections 311, 402, and 404	Clean Water Act (Public Law 92-500, as amended)

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 57 30-1, Pollution Prevention Plan:

1. As required by the stormwater permit for discharges from construction sites.
2. Include copy of permits and approved pollution prevention plan.

C. RSN 01 57 30-2, Spill Prevention, Control, and Countermeasure (SPCC) Plan:

1. Submit when SPCC Plan is required in accordance with 40 CFR, Part 112.
   a. SPCC Plan is required where release of oil and oil products could reasonably be expected to enter into or upon navigable waters of the United States or adjoining shorelines in quantities that may be harmful (40 CFR, Part 110), and aggregate on site oil storage capacity is over 1,320 gallons. Only containers with capacity of 55 gallons and greater are included in determining on site aggregate storage capacity.

2. Reviewed and certified by a registered professional engineer in accordance with 40 CFR, Part 112, as required by section 311 of the Clean Water Act (Public Law 92-500 as amended).

1.04 REGULATORY REQUIREMENTS

A. Construction Safety Standards: Comply with sanitation and potable water requirements of section 2.06 of RSHS.

B. Laws, Regulations, and Permits:

1. Perform construction operations to comply, and ensure subcontractors comply, with:

   a. Applicable Federal, State, and local laws, orders, regulations, and Water Quality Standards concerning control and abatement of water pollution; and terms and conditions of applicable permits issued by permit issuing authority.

   b. If conflict occurs between Federal, State, and local laws, regulations, and requirements, the most stringent shall apply.

C. Contractor Violations:

1. If noncompliance should occur, immediately (verbally) report noncompliance to the COR. Submit specific written information within 2 days.

2. Violation of applicable Federal, State, or local laws, orders, regulations, or Water Quality Standards may result in the CO stopping site activity until compliance is ensured.

3. The Contractor shall not be entitled to extension of time, claim for damage, or additional compensation by reason of such a work stoppage.

4. Corrective measures required to bring activities into compliance shall be at the Contractor's expense.

1.05 REQUIRED PERMITS

A. Stormwater Discharge Permit Associated with a Construction Site:

1. The Contractor shall obtain and meet the conditions of the National Pollutant Discharge Elimination System (NPDES)/Construction General Permit (CGP) from the Environmental Protection Agency (EPA).

   a. https://www.epa.gov/npdes/stormwater-discharges-construction-activities

2. Notice of Intent (NOI): Both Reclamation and the Contractor shall sign the NOI to obtain coverage under a stormwater general permit to control stormwater discharges from the construction site as required under section 402 of the Clean Water Act (Public Law 92-500, as amended).

3. Pollution Prevention Plan:

   a. The Contractor shall prepare a Pollution Prevention Plan as required by the permit.

   b. Comply with terms and conditions to obtain and maintain this stormwater discharge permit.

4. Monitoring and Water Treatment:

   a. Provide monitoring and water treatment, if necessary, to achieve compliance with applicable Water Quality Standards.

   b. Provide the recordkeeping required by the stormwater discharge permit associated with construction activity.

1.06 CONTRACTOR RESPONSIBILITIES

A. Permits: Any permits obtained by Reclamation are exceptions to the clause at FAR 52.236-7, Permits and Responsibilities, which requires the Contractor to obtain necessary licenses and permits.

B. Monitoring:

1. Conduct monitoring in order to meet the requirements of the permits which may include:

   a. Sampling,

   b. Site inspections, and

   c. Required laboratory tests to determine effluent characteristics.

C. Reporting Results: The Government will report required monitoring results to appropriate agencies. The section 402 wastewater discharge permit has specific reporting requirements for the permittee for noncompliance when effluent limitations are exceeded.

D. Recordkeeping: Retain records and data required by permits.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 POLLUTION CONTROLS

A. Control pollutants by use of sediment and erosion controls, wastewater and stormwater management controls, construction site management practices, and other controls including State and local control requirements.

B. Sediment and Erosion Controls:

1. Establish methods for controlling sediment and erosion which address vegetative practices, structural control, silt fences, straw dikes/waddles, sediment controls, and operator controls as appropriate.

2. Institute stormwater management measures as required, including velocity dissipators, and solid waste controls which address controls for building materials and offsite tracking of sediment.

C. Wastewater and Stormwater Management Controls:

1. Pollution Prevention Measures:

a. Use methods of dewatering, unwatering, excavating, or stockpiling earth and rock materials which include prevention measures to control silting and erosion, and which will intercept and settle any runoff of sediment-laden waters.

b. Prevent wastewater from general construction activities such as drainwater collection, aggregate processing, concrete clean-out, drilling, grouting, or other construction operations, from entering flowing or dry watercourses without the use of approved turbidity control methods.

c. Divert stormwater runoff from upslope areas away from disturbed areas.

2. Turbidity Prevention Measures:

a. Use methods for prevention of excess turbidity which include, but are not restricted to, intercepting ditches, settling ponds, gravel filter entrapment dikes, flocculating processes, recirculation, combinations thereof, or other approved methods that are not harmful to aquatic life.

b. Wastewaters discharged into surface waters shall meet conditions of section 402, the National Pollutant Discharge Elimination System (NPDES) permit.

c. Operation of mechanized equipment in waterbodies is limited to necessary pumping during the low-flow work window. Pumps must be placed with land-based equipment, see Section 31 03 10 – Diversion and Care of Water During Construction.

D. Construction Site Management:

1. Contractor Construction Operations:

a. Perform construction activities by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, or other pollutants or wastes into streams, flowing or dry watercourses, lakes, wetlands, reservoirs, or underground water sources.

1) Pollutants and wastes include, but are not restricted to: refuse, garbage, cement, sanitary waste, industrial waste, hazardous

materials, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.

2. Stockpiled or Deposited Materials: Do not stockpile or deposit excavated materials or other construction materials, near or on, stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the watercourse.

3. Petroleum Product Storage Tanks Management:

   a. Place oil or other petroleum product storage tanks at least 20 feet from streams, flowing or dry watercourses, lakes, wetlands, reservoirs, and any other water source.

   b. Do not use underground storage tanks.

   c. Construct storage area dikes at least 12 inches high or graded and sloped to permit safe containment of leaks and spills equal to storage tank capacity located in the area plus sufficient freeboard to contain the 25-year rainstorm. Line diked areas with an impermeable barrier at least 50 mils thick.

   d. Areas for refueling operations: Lined with impermeable barrier at least 40 mils thick covered with 2 to 4 inches of soil.

END OF SECTION

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SECTION 01 57 35
OIL SPILL PREVENTION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for items of work that require oil spill prevention measures.
2. Contractor is responsible for damages resulting from oil spills resulting from work performed under this contract.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1. ASTM D2103-15 Polyethylene Film and Sheeting

1.03 REGULATORY REQUIREMENTS

A. Comply with Federal, State, and local regulations for oil-spill and control regulations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Polyethylene Sheeting: ASTM D2103, thickness 6 mils minimum.

PART 3 EXECUTION

3.01 ONSITE SPILL PREVENTION

A. Contractor is responsible for spills or leaks during performance of this contract which occur as a result of, or are contributed to by, the actions of the Contractor's agents, employees, or subcontractors.

3.02 SPILLS OR LEAKS

A. Stop source of spill or leak.

B. Stop migration of spill or leak.

C. Place berm of sorbent material around perimeter of spill.

D. Solidify free standing oil.

3.03 REPORTING

A. Report spills or leaks, regardless of quantity, to COR within 4 hours of their discovery.

B. Make follow-up written report to COR not later than 7 days after initial report. Include in a narrative form, as a minimum, the following:

1. Description of item spilled. Include identity, quantity, manifest number.
2. Whether or not amount spilled is EPA or State reportable. If so, when it was reported.
3. Exact time and location of spill including a description of the area involved.
4. Containment procedures initiated.
5. Summary of communications with media or Government officials other than COR.
6. Description of clean-up procedures employed or to be employed at the site.
7. Disposal location and methods.

3.04 CLEANUP

A. Clean up spills or leaks to satisfaction of COR and in a manner that complies with applicable Federal, State, and local laws and regulations.

B. Pump spill material and any contaminated liquids into DOT approved containers for disposal. Label containers with material and fill date according to 40 CFR 262.31 and 40 CFR 262.32.

C. Place contaminated porous solids; such as, but not limited to; soil, asphalt, wood, and paper into Department of Transportation removable head drums. Label and date drums.

D. Decontaminate non-porous materials using a solvent, such as xylene, toluene, hexane, or kerosene. Place rags and solvents used in decontamination in Department of Transportation removable head drums. Label and date drums.

E. If spill exceeds onsite control and cleanup capabilities, hire outside subcontractor specializing in environmental cleanup to perform cleanup.

F. For cleanup operations, document extent of spill, effectiveness of cleanup operations, and point in time when the environment has been decontaminated as approved by COR.

G. Perform cleanup at no additional cost to Government.

3.05 DISPOSAL

A. Handle and dispose of spilled or leaked materials contaminated with 50 ppm or greater polychlorinated biphenyls.

B. Handle and dispose of spilled or leaked materials not contaminated or contaminated with less than 50 ppm polychlorinated biphenyls in accordance with applicable Federal, State, and local regulations.

END OF SECTION

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SECTION 01 57 50
TREE AND PLANT PROTECTION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work, except as specified.
2. Costs for repair or treatment of injured vegetation and replacement of trees or shrubs are the Contractor's responsibility.

1.02 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 57 50-1, Protection Plan:

1. Description of protective barriers or other methods used to protect vegetation from damage or injury caused by construction operations.

PART 2 PRODUCTS

2.01 REPLACEMENT TREES AND SHRUBS

A. Species: Same as removed tree or shrub or other species approved by the COR.

B. Size: Same size as removed tree or shrub, or maximum practicable size that can be planted and sustained in the particular environment as approved by the COR.

PART 3 EXECUTION

3.01 PRESERVATION AND PROTECTION

A. Preserve natural landscape and preserve and protect existing vegetation not required or otherwise authorized to be removed. Submit requests to remove vegetation not specifically required to be removed to the COR.

B. Conduct operations to prevent unnecessary destruction, scarring, or defacing of natural surroundings in the vicinity of the work.

C. Protect vegetation from damage or injury caused by construction operations, personnel, or equipment by the use of protective barriers or other methods approved by the COR.

D. Minimize, to the greatest extent practicable, clearings and cuts through vegetation. Irregularly shape authorized clearings and cuts to soften undesirable aesthetic impacts.

E. Do not use trees for anchorages except in emergency cases or as approved by the COR.

1. For such use, wrap the trunk with a sufficient thickness of approved protective material before rope, cable, or wire is placed.

2. Submit requests to use trees for anchorage, except for emergencies. Include description of protective material.

F. Use safety ropes where tree climbing is necessary; do not use climbing spurs.

3.02 REPAIR, TREATMENT, OR REPLACEMENT

A. The Contractor is responsible for injuries to vegetation caused by Contractor operations, personnel, or equipment.

B. Employ the services of an experienced arborist or licensed tree surgeon to direct repair, treatment, and replacement of injured vegetation. Submit qualifications of experienced arborist or licensed tree surgeon to COR prior to employment.

C. Repair or treat injured vegetation without delay and as recommended by and under direction of an experienced arborist or licensed tree surgeon.

D. Remove and dispose of trees or shrubs not required or otherwise authorized to be removed that, in the opinion of the COR, are injured beyond saving.

E. Replace removed tree or shrub with tree or shrub approved by the COR.

1. For a period of 1 year, guy as required, water, and maintain replacement trees and shrubs.

2. Remove and replace replacement trees or shrubs that die within the 1-year period. Maintain such replacements for a period of 1 year from the date of replacement.

END OF SECTION

SECTION 01 57 60
PROTECTED SPECIES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 PROJECT CONDITIONS

A. Certain native species in Washington State are protected plant or animal species under State law(s). The Government has ascertained that protected species are outside the immediate project area. A copy of the document is available upon request from the COR.

B. Insert this section in subcontracts which involve performance of work in areas where protected species may occur.

C. In accordance with State law, the Government may arrange for removal of protected species, and the Contractor shall cooperate with those performing such removal. If these species are not removed, cooperate with and abide by protection plans developed by appropriate State entities to avoid damage to or disturbance of protected species.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

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SECTION 01 57 70
FIRE PROTECTION AND PREVENTION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. Bureau of Reclamation (Reclamation)

1. RSHS — Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/safety/rshs/index.html

B. Washington State Department of Natural Resources

1. IFPL — Industrial Fire Precaution Levels, Contact, Wildfire Division at http://www.wd@dnr.wa.gov

1.03 DEFINITIONS

A. IFPL: Industrial Fire Precaution Levels

1.04 REQUIREMENT

A. Contractor shall prepare prevention plan and carry out effective fire-protection.

1.05 REGULATIONS

A. Comply with Federal, State and local codes and regulations.

1. State regulations applied by Washington State Department of Natural Resources, Wildfire Division.

B. In the event of a conflict between regulations the most stringent having jurisdiction shall apply.

C. Use the Industrial Fire Precaution Levels system to govern operations under this contract.

1. Use weather data from the weather stations to calculate and predict the daily IFPL.

2. Historical data based on historical weather data can be obtained from the U.S. Forest Service and Washington State Department of Natural Resources.

3. A variance may be granted, with a written agreement to allow for operations restricted by the IFPL to continue with implementation of additional fire precautionary measures by the Contractor may be granted by the U.S. Forest Service and Washington State Department of Natural Resources.

   a. Specifically, variances may be granted for individual work units or a grouping of units; after consideration of fuel conditions, fire suppression resource response time, additional fire precautionary measures, and other specific site conditions.

4. The Contractor, Washington State Department of Natural Resources and U.S. Forest Service may agree to a variance for operations restricted under Washington State Department of Natural Resources.

1.06 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 01 57 70-1, Approved Fire Protection and Prevention Plan:

1. Approved by Washington State Department of Natural Resources.

2. Include, as a minimum, the following:

   a. A list of all major fire hazards, proper handling and storage procedures for hazardous materials, potential ignition sources and their control, and the type of fire protection equipment necessary to control each major hazard.

   b. Procedures to control accumulations of flammable and combustible waste materials.

   c. Procedures for regular maintenance of safeguards installed on heat-producing equipment to prevent the accidental ignition of combustible materials.

   d. The name or job title of employees responsible for maintaining equipment to prevent or control sources of ignition or fires.

   e. The name or job title of employees responsible for the control of fuel source hazards.

   f. Means to educate all construction workers about the risk of starting a wildfire and how to avoid it and who to contact in case a wildfire is started.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 DEFENSIBLE SPACE/FIRE BREAKS

A. Create a fire break around and adjacent to offices, shops, and other work areas by clearing away all flammable vegetation or combustible growth.

1. Maintain any tree adjacent to or overhanging any building, trailer, shop, or work area, free of dead or dying wood.
2. Maintain roof of any structures including temporary offices or shops free of leaves, needles, or other dead vegetative growth.

B. Permanent and Temporary Access and Haul Roads:

1. Remove grass, brush, and combustible materials from roadway and roadway shoulders out to slope break along fill sections of road within Contractor Staging areas and right-of-way.
   a. Place gravel to depth necessary to prohibit regrowth of grass and brush or treat with COR-approved herbicide to prevent regrowth of grass and brush, in area between edge road travelway and slope break along fill sections of road.
2. In cut sections of road remove grass and brush from road shoulders and up cut slope to 5 feet.
   a. Place gravel to depth necessary to prohibit regrowth of grass and brush or treat with COR-approved herbicide to prevent regrowth of grass and brush on road shoulders and up cut slope to 5 feet.
3. Trees in this area may be left in place after being pruned 8 feet up tree from ground.
4. Maintain roadsides clear of grass and brush for period of contract.

C. Fire tools and preventative actions required at shops, staging areas, and other stationary work areas where equipment machinery or tools that can cause sparks are used:

1. Clear away flammable materials for 25 feet.
2. Maintain one serviceable round point shovel overall length not less than 46 inches. Maintain a 5-gallon minimum backpack pump water-type fire extinguisher or one 5-gallon minimum pressurized water fire extinguisher.

D. Fire tools required in areas where portable tools powered by internal combustion engines are used within 25 feet of any flammable material.

1. Maintain one serviceable round point shovel, minimum overall length 46 inches, and one 5 pound minimum pressurized fire extinguisher or 5-pound back pump.
2. Keep required fire tools within 25 feet of operating equipment powered by internal combustion engine.

E. Passenger vehicles and construction machinery requirements.

1. Passenger vehicles, cars, pickups, light trucks, shall be equipped with one water fire extinguisher or backpack pump 5-pound minimum capacity, excluding personal vehicles parked at Field Office area.

2. Any internal combustion engine operated on or near forest, brush, grass covered land shall be equipped with a spark arrester or the engine shall be constructed, equipped and maintained for prevention of fire.

3. Comply with RSHS.

F. Provide water truck equipped with 500 feet of 1.5-inch single jacket hose, nozzle and pressure pump. Truck with 300-gallon (minimum) water must be on site at each work feature where work is being performed with trained operator during work hours. Water truck may be used for other watering work on site but must be immediately available for fire suppression duty.

END OF SECTION

SECTION 01 57 90

PRESERVATION OF HISTORICAL AND ARCHEOLOGICAL DATA

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Except as provided for an equitable adjustment, include in prices offered in the Price Schedule for other items of work.

1.02 DEFINITIONS

A. Cultural resources: Includes prehistoric, historic, architectural, and traditional cultural properties. These include, but are not limited to, human skeletal remains, archaeological artifacts, records, and material remains related to such property.

B. Cultural items: Native American cultural items (i.e., funerary objects, sacred objects, objects of cultural patrimony, or human remains) for which protection is prescribed under the Native American Graves Protection and Repatriation Act (NAGPRA) - Public Law 101-601; 104 Stat. 3042, Section 3(d); and 43 CFR Part 10.4.

C. Human remains: Physical remains of the body of a person.

D. Funerary objects: Native American items that, as part of the death rite or ceremony of a culture, are reasonably believed to have been placed intentionally at the time of death or later with or near individual human remains.

E. Native American: Of, or relating to, a tribe, people, or culture that is indigenous to the United States.

F. Sacred Objects: Native American items that are specific ceremonial objects needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present-day adherents. These items are specifically limited to objects that were devoted to a traditional Native American religious ceremony or ritual and which have religious significance or function in the continued observance or renewal of such ceremony.

G. Objects of cultural patrimony: Native American items having ongoing historical, traditional, or cultural importance central to the tribe itself, rather than property owned by an individual tribal member. These objects are of such central importance that they may not be alienated, appropriated, or conveyed by any individual tribal member.

1.03 REFERENCES

A. Refer to Section 51 00 30 – Inadvertent Discovery Plan:

a. Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Remains, Leavenworth NFH – SWISP Project, Chelan County, Washington, Township 24 North, Range 17 East, Sections 23, 26 and 27, Leavenworth USGS Quad.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 01 57 90-1, Proposed Use, Borrow, and Spoil/Waste Areas:

1. When use area or borrow area (including parking, staging, and contractor laydown yards), other than those approved is to be used, submit map showing location of unapproved use or borrow areas, for approval.

   a. Map or drawing showing the use type, locations, and extents of each area to be used.

2. Areas identified as Contractor Use Areas on the drawings may be used without CO approval prior to work. All other areas to be used require CO approval prior to work.

   a. Contractor shall not directly contact or coordinate with private landowners.

   b. Prior to use of areas outside of the identified work areas or Contractor Use Areas, Contractor must provide written documentation demonstrating that the use, borrow or spoil/waste area has been inventoried for cultural resources to the COR and for approval by the Project Archaeologists as required by the National Historic Preservation Act.

   c. Once the COR has received approval of site use by the Project Archaeologists, the areas are subject to review under the National Environmental Policy Act and related laws.

   d. COR shall retain the authority to designate all use areas as approved for work.

   e. Review and approvals will take a minimum of 45 days.

1.05 PROJECT CONDITIONS

A. Federal legislation provides for protection, preservation, and collection of scientific, prehistorical, historical, and archeological data, including relics and specimens, which might otherwise be lost due to alteration of terrain as a result of any Federal construction project.

B. Any person who, without permission, injures, destroys, excavates, appropriates, or removes any historical or prehistorical artifact, object of antiquity, or archeological resource on public lands of the United States is subject to arrest and penalty of law.

C. Comply with state laws when operating on non-Federal and non-Tribal lands.

D. Discovery of Resources

1. Contractor, or any of the Contractor's employees, or parties operating or associated with the Contractor, in performance of this contract discover cultural resources on any lands:

2. Refer to Section 51 00 30 – Inadvertent Discovery Plan:

   a. Follow the procedures provided in the Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Remains:

      1) Immediately cease work at that location.

      2) Provide immediate verbal notification to the COR, giving the location and nature of the findings.

      3) Follow with written confirmation to the CO within 2 days.

3. In addition to notifying the COR, where the discovery occurs on federal land:

   a. Provide immediate verbal notification to the Archaeologist listed in the Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Remains.

   b. Follow with written confirmation to the Archaeologist listed in the Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Remains within 2 days.

4. In addition to notifying the COR:

   a. Where the discovery occurs on state, municipal, or private lands, notify the appropriate state officials as prescribed by state law as identified in Section 51 00 30 – Inadvertent Discovery Plan - Plan and Procedures for the Inadvertent Discovery of Cultural Resources and Human Remains.

5. Exercise care so as not to disturb or damage cultural resources uncovered during construction activities and provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition by the CO/COR after consulting with the USFWS Archaeologist and the USBR Archaeologist.

6. Do not resume work in the area of discovery until receipt of written notice to proceed from the CO.

E. Where appropriate by reason of discovery, the CO may order delays in time of performance or changes in work, or both. When such delays or changes are ordered, an equitable adjustment will be made in the contract in accordance with applicable clauses of the contract.

F. When the Contractor proposes to use a location other than an approved site shown on the drawings, the location must first be approved by the CO.

1. Submit a map showing the location of proposed sites to the CO at least 45 days in advance of use.
2. Take no action to use or alter the proposed location until written approval for site use is received from the CO and cultural and National Environmental Policy Act reviews have been completed.
3. Do not directly contact private landowners.

G. Include permission for Government access in arrangements for use of private lands for use areas or borrow sources. Government access to the private land shall be to confirm the absence of cultural resources as reported by the Contractor in their submittals and conduct appropriate inspections.

H. Insert this section in subcontracts which involve performance of work on jobsite terrain.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. When the Price Schedule includes a separate item for furnishing a material, include cost of furnishing, hauling, storing, and handling in the price offered in Price Schedules for the item.
2. When the Price Schedule does not include a separate item for furnishing a material, include cost of furnishing, hauling, storing, and handling in the price offered in the Price Schedule for work for which the material is required.

1.02 DEFINITIONS

A. Essential Characteristics: As used in these specifications, the term "essential characteristics" is synonymous with the term "salient characteristics."

B. Salient Characteristics: Those qualities of an item that are essential to ensure that the intended use of the item can be satisfactorily realized.

1.03 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)

1.	ASME B1.1-2003(2008)	Unified Inch Screw Threads, (UN and UNR Thread Form)
2.	ASME B1.20.1-2013	Pipe Threads, General Purpose, Inch

B. Bureau of Reclamation (Reclamation)

1.	RSHS	Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/safety/rshs/index.html

1.04 DELIVERY, STORAGE, AND HANDLING

A. Transport and handle manufactured products in accordance with manufacturer's instructions.

B. Store and protect manufactured products in accordance with manufacturer's instructions and RSHS. Obtain instructions from the manufacturer before delivery of materials to jobsite. Maintain a copy of instructions at jobsite.

C. Remove and replace damaged items with new items.

D. Protect materials subject to adverse effects from moisture, sunlight, ultraviolet light, or weather during storage at jobsite.

E. Store curing compounds, sealants, adhesives, paints, coatings, sealers, joint compounds, grouts, and similar products at the temperature and environmental conditions recommended by manufacturer.

1.05 MAINTENANCE

A. Extra Materials:

1. Furnish additional maintenance materials specified as "extra materials" in the specifications. Provide maintenance material identical to installed material and provide from the same manufacturer's production lot as installed material.
2. Package extra materials for storage and label with complete product identification on packaging.
3. Deliver extra materials to the Government at jobsite and place in storage as approved by the COR.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide type and quality described in these specifications. Make diligent effort to procure specified materials from all available sources.

B. Furnish new materials conforming to referenced standards unless otherwise specified.

1. References to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use equipment, material, article, or process that, in the judgment of the CO, is equal to that named in the specifications, unless otherwise specified.

C. For materials not covered by these or referenced specifications, furnish materials of standard commercial quality.

D. If materials to be used deviate from or are not covered by recognized specifications and standards, submit, for approval, justification for and exact nature of the deviation, and complete specifications for materials proposed for use.

E. Make parts accurately to standard gauge where possible.

1. Use unified screw threads conforming to ASME B1.1 or B1.20.1 for threads, including but not limited to those of bolts, nuts, screws, taps, pipes, and pipefittings.
2. For internal connections only, the Contractor may deviate from ASME standards, provided a complete set of taps and dies are furnished as required to facilitate repair or replacement.

F. Permanently mark fasteners with a symbol identifying the manufacturer and with symbol(s) indicating grade, class, type, and other identifying marks in accordance with reference or applicable standard.

2.02 SUBSTITUTIONS

A. If materials required by these specifications become unavailable, because of Government priorities or other causes, substitute materials may be used.

B. Obtain written approval to use substitute materials from the CO. State in the request for approval the amount of the adjustment, if any, to be made in favor of the Government.

C. The Government's determination as to whether substitution will be permitted and as to what substitute materials may be used, shall be final and conclusive.

D. If approved substitute materials are of less value to the Government or involve less cost to the Contractor than specified material, a contract adjustment will be made in favor of the Government. Where the amount involved or the importance of substitution warrants, a deductive modification to the contract will be issued.

E. No payments in excess of prices offered in the schedule will be made because of substitution of one material for another or because of use of one alternate material in place of another.

2.03 WORKMANSHIP

A. Accurately manufacture and fabricate materials in accordance with best modern practice and requirements of these specifications, notwithstanding minor errors or omissions therein.

B. Use liberal factors of safety and adequate shock-absorbing features in designs, especially for parts subjected to variable stress or shock, including alternating or vibrating stress or shock.

C. Include provisions which prevent components from loosening for shock-absorbing features and parts subject to vibration.

D. For rotating parts of motors and exciters, maximum unit stress due to runaway speed shall not exceed 2/3 of the yield point.

2.04 SOURCE QUALITY ASSURANCE

A. Materials will be subject to inspection in accordance with clause at FAR 52.246-12, Inspection of Construction, at following locations as determined by the COR:

1. At place of production or manufacture.
2. At shipping point.
3. At jobsite.

B. To allow sufficient time to provide for inspection, submit at time of issuance, copies of purchase orders, including drawings and other pertinent information, covering material on which inspection will be made as advised by the COR, or submit other evidence if such purchase orders are issued verbally or by letter.

C. Inspection of materials at locations specified above or waiving of inspection shall not be construed as being conclusive as to whether materials and equipment conform to contract requirements under the clause at FAR 52.246-12, Inspection of Construction, nor shall the Contractor be relieved thereby of the responsibility for furnishing materials meeting the requirements of these specifications.

D. Acceptance of materials will be made only at the jobsite.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's recommendations unless otherwise specified.

3.02 FIELD QUALITY ASSURANCE

A. Final inspection and acceptance of materials will be made only at the jobsite after installation and testing.

END OF SECTION

SECTION 01 61 10
BUY AMERICAN

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 DEFINITIONS

A. Buy American Material: In accordance with FAR 52.225-11 Buy American-Construction Materials under Trade Agreements.

1.03 SUBMITTAL

A. Include applicable certification for material in each RSN listed in Table 01 33 00A – List of Submittals in accordance with FAR 52.225-11 Buy American-Construction Materials under Trade Agreements.

B. Submit the following in accordance with Section 01 33 00 - Submittals.

C. RSN 01 61 10-1, Buy American Certificates:

1. Prior to project closeout, provide applicable Buy American Certificate for materials used on the project.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CERTIFICATION

A. Deliver applicate certificate in accordance with 52.225-11 Buy American-Construction Materials under Trade Agreements to COR with material delivered to the site.

B. Reclamation will not accept material without proper certification.

END OF SECTION

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SECTION 01 71 20
SURVEYING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 SUBMITTALS

A. Submit in accordance with Section 01 33 00 – Submittals.

B. RSN 01 71 20-1, Surveying Plan:

1. Describe work layout and survey methods.
2. Include surveying schedule.

C. RSN 01 71 20-2, Resume:

1. Engineer or surveyor responsible for supervising and directing survey work.

D. RSN 01 71 20-3, Accuracy Check Results:

1. Accuracy check of Government-established primary control.

E. RSN 01 71 20-4, Electronic Survey Data Files and Printouts:

1. Copy of raw electronic data files downloaded from survey data collector accompanied with archived raw data files.
   a. Include three hardcopy printouts of raw data files clearly labeled with filename, purpose of survey, survey control points used, and date in each submittal set.
2. Copy of edited data files downloaded from survey data collector if the raw data file was edited for corrections. The only corrections allowed are rod height changes, point descriptor edits, and addition of survey control points to the data file (storing control points).
   a. Include three hardcopy printouts of edited data files clearly labeled with filename, purpose of survey, survey control points used, and date in each submittal set.
3. Copy of ASCII file containing points generated by data files downloaded from survey data collectors using comma delimited, point number, northing, easting, elevation, description point format.

a. Include in the submittal hardcopy printouts of point files clearly labeled with filename, purpose of survey, survey control points used, and date.

4. Develop topographic and structural data, cross sections, and quantity computations in electronic drawing file using software compatible with Autodesk AutoCAD 2018, or later versions approved by the COR.

F. RSN 01 71 20-5, Quantity Survey Notes and Computations:

1. Itemized statement for work covered by notes and computations.

a. Electronic files that support calculations (i.e. dwg, ASCII, dems, land XML).

2. When progress payment invoice includes unit priced pay item that surveys required for computing quantities, this submittal is part of documentation required for a proper invoice for progress payments in accordance paragraph (a)(2)(xi) of the clause at FAR 52.232-27 - Prompt Payment for Construction Contracts.

1.03 PRIMARY CONTROL

A. The Government has established primary control to be used for establishing work lines and grades.

B. Primary control consists of bench marks and horizontal control points in work vicinity as shown on drawings.

C. Check and verify primary control and resolve discrepancies with Government before beginning work.

D. Preserve and maintain primary control points until otherwise authorized. Government may reestablish damaged or destroyed primary control points and backcharge reestablishment cost to the Contractor.

1.04 QUALIFICATIONS

A. Surveyors: Experienced construction surveyors under supervision and direction of engineer or surveyor with minimum of 5 years of experience in charge of construction surveys for construction similar in nature to that required by this contract.

PART 2 PRODUCTS

2.01 SURVEYING MATERIALS AND EQUIPMENT

A. Provide materials and equipment required for surveying work, including, but not limited to, instruments, stakes, spikes, steel pins, templates, platforms, and tools.

B. Except as required to be incorporated in work or left in place, surveying materials and equipment will remain property of Contractor.

PART 3 EXECUTION

3.01 LAYOUT OF WORK SURVEYS

A. Establish lines and grades for work layout from Government-established primary control points.

B. Establish measurements required for work execution to specified tolerances.

C. Provide stakes, markers, and other survey controls necessary to control, check, and guide construction.

D. Boundaries of all work extents shall be clearly marked with survey laths and flagging.

E. Verify alignment and layout of locations as needed.

3.02 SURVEY SUBMITTAL REQUIREMENTS

A. Electronic Survey Data Files and Printouts:

1. Copy of raw electronic data files downloaded from survey data collector accompanied with archived raw data files. Include hardcopy printouts of raw data files clearly labeled with filename, purpose of survey, survey control points used, and date of survey in each submittal set.

2. Copy of edited data files downloaded from survey data collector if the raw data file was edited for corrections. The only corrections allowed are rod height changes, point descriptor edits, and addition of survey control points to the data file (storing control points in data file). Include hardcopy printouts of edited data files clearly labeled with filename, purpose of survey, survey control points used, and date of survey in each submittal set.

3. Copy of ASCII file containing points generated by data files downloaded from survey data collectors using coma delimited, point number, northing, easting, elevation, description point format. Include in the submittal hardcopy printouts of point files clearly labeled with filename, purpose of survey, survey control points used, and date of survey.

4. Develop topographic and structural data, cross sections, and quantity computations in electronic drawing file using software compatible with Autodesk AutoCAD 2018 or later versions.

3.03 QUANTITY SURVEYS

A. Perform surveys and computations to determine quantities of work performed or placed during each progress payment period.

B. Perform surveys necessary for the Government to determine final quantities of work in place. Final payment quantities will be based on the Government's original terrain data and submitted survey data and computations.

C. Perform quantity surveys in presence of an authorized Government representative, unless specifically waived. Notify the Government at least 24 hours before performing a quantity survey.

3.04 SURVEY REQUIREMENTS

A. Structures: Stake out of structures and checkouts before and during construction.

B. As-builts: As required for structures and other features of work.

3.05 ACCURACY

A. Degree of Accuracy:

1. Structure points: Set within 0.01-foot, except where installation or operation considerations require tighter tolerances.
2. Vertical elevation surveys: Close within 0.05-foot times the square root of the circuit length in miles.

B. Include check measurement on known survey point(s) at the beginning and ending of each survey.

3.06 FIELD RECORDS

A. Survey data will be collected in an electronic data collector device.

B. Electronic raw and edited data files with hard copy printouts are the records of survey.

C. Other records of survey data collection and recording require approval of the COR.

END OF SECTION

SECTION 01 74 00
CLEANING AND WASTE MANAGEMENT

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work, except as specified.
2. Cost of environmental site assessments are the Contractor's responsibility.

1.02 DEFINITIONS

A. Hazardous Waste: Defined as hazardous by 40 CFR 261.3; or by other Federal, State, or local laws or regulations.

1.03 REFERENCE STANDARDS

A. Bureau of Reclamation (Reclamation)

1.	RSHS	Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/safety/rshs/index.html

B. Code of Federal Regulations (CFR)

1.	40 CFR 261.3	Definition of Hazardous Waste
2.	49 CFR 171-179	Transportation - Hazardous Waste Regulations

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 74 00-1, Waste Production and Disposal Plan:

1. For each type of waste, list estimated quantity and planned disposal location.

C. RSN 01 74 00-2, Waste Production and Disposal Records:

1. For each type of waste, list quantity and disposal location in format provided.

a. Format:

Month	Amount of Waste Generated in Pounds	Amount Recycled in pounds	Amount Stockpiled for Re-use in pounds	Amount Disposed of in Pounds	Disposal Location

2. Include certifications that waste was properly disposed.

3. Hazardous wastes manifests.

D. RSN 01 74 00-3, Environmental Consultant Resume:

1. Describe experience on similar project.

E. RSN 01 74 00-4, Environmental Site Assessment.

1.05 QUALIFICATIONS

A. Environmental Consultant: Minimum 2 years' experience in conducting environmental site assessments for similar construction.

1.06 REGULATORY REQUIREMENTS

A. Comply with Federal, State, and local laws and regulations.

B. Comply with RSHS.

C. Conform to most stringent requirement in cases of conflict between specifications, regulatory requirements, and RSHS.

1.07 PROJECT CONDITIONS

A. Report waste materials discovered at jobsite to COR.

1. Cease work in areas where waste may be hazardous until waste materials are investigated by the Government.

2. If waste is hazardous, the CO may order delays in time of performance or changes in work, or both.

3. If such delays or changes are ordered, an equitable adjustment will be made in the contract in accordance with applicable clauses of the contract.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 PROGRESS CLEANING

A. Keep work and storage areas free from accumulations of waste materials and rubbish.

3.02 FINAL CLEANUP

A. Remove temporary plant facilities, buildings, concrete footings and slabs, rubbish, unused materials, concrete forms, and other similar materials which are not part of permanent work.

B. Leave premises "broom clean."

C. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces.

D. Clean equipment and fixtures to a sanitary condition.

E. Replace filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts and drainage systems.

G. Sweep paved areas and rake clean landscaped areas.

3.03 DISPOSAL

A. Nonhazardous Waste Materials:

1. Reuse at jobsite or reuse or recycle waste materials removed from jobsite whenever possible.
2. Dispose of materials not reused at jobsite by removal from jobsite.
3. Dispose of nonhazardous waste materials that are not reused or recycled at appropriately permitted disposal facilities.

B. Hazardous Waste Disposal:

1. Dispose by removal from jobsite.
2. Recycle hazardous waste whenever possible.
3. Dispose of hazardous waste materials that are not recycled at appropriately permitted treatment or disposal facilities.
4. Transport hazardous waste in accordance with 49 CFR 171-179.

C. Certification: Certify that wastes are disposed of in accordance with Federal, State, and local regulations.

3.04 SITE ASSESSMENT

A. Upon completion of work, perform site assessment at following areas for work done under these specifications:

1. Hazardous waste accumulation areas.
2. Petroleum dispensing and storage areas where aggregate storage of petroleum at jobsite was over 110 gallons.
3. Hazardous material storage areas.

B. Employ qualified environmental consultant to perform assessments.

C. Demonstrate and document by appropriate analytical sampling that site contamination is less than State action cleanup levels.

3.05 RECORDS

A. Keep records of types and amounts of waste materials produced.

B. Keep records of waste material disposal.

END OF SECTION

SECTION 01 78 30
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 DEFINITIONS

A. As-built Drawings (Also known as "Red-line" Drawings):

1. Set of full size, hard-copy drawings, that contain both Government informational drawings supplied with Specifications and Contractor produced drawings that have been submitted for approval.

B. Final Drawings:

1. Complete electronic set of drawings produced by Contractor for each item requiring drawings updated to reflect all changes made in the field through installation and testing of each item.

1.03 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 01 78 30-1, Draft As-built Drawings:

1. Certified marked prints. As-built drawings that have been certified by Contractor as being up to date and accurate of work performed. Submit changed specification drawings and information drawings.
2. If changes are made to information drawings, include changed drawings in the submitted drawing set.

C. RSN 01 78 30-2, Final Drawings:

1. Updated with all changes as marked on As-built Drawings to reflect approval comments.
   a. Final as-built drawings shall use the latest versions of Reclamation revisions provided by Reclamation. Coordinate with the COR.
   b. Final as-built drawings of information drawings are not required.

D. RSN 01 78 30-3, Extra Materials Inventory:

1. Include part, number provided, and specification requirement.

2. See 1.06.

1.04 AS-BUILT DRAWINGS

A. Maintain 2 sets of full-size prints of contract drawings marked to show accurate and complete records of as-built conditions. Keep drawings at the jobsite and mark as work progresses.

1. Mark and dimension to show variations between actual construction and that indicated or specified in contract documents.

   a. Include buried or concealed construction and utilities.

   b. Include existing items, topographic features, and utility lines revealed during construction which differ from those shown on contract drawings.

2. Mark to define construction actually provided where choice of materials or methods is permitted in specifications, or where variations in scope or character of work from that of the original contract are authorized.

B. Use standard drafting practice to represent changes and include supplementary notes, legends, and details necessary to clearly portray as-built construction.

C. Mark as-built drawings in the following colors:

1. Red - Additions to original drawings.

2. Green - Deletions to original drawings.

3. Blue - Notations necessary for explanation of as-built markings.

D. Allow the Government to review the drawings at all times.

E. Update record drawings to document work or services performed for progress payments in accordance with the clauses at FAR 52.232-27, Prompt Payment for Construction Contracts. The CO will retain from progress payments, if project drawings are not updated:

1. The CO shall retain from progress, or other payments made under this contract, 15 percent of the amount in all the Schedules under this contract for Contract Line Item Numbers (CLINs) where “Record Drawings” cost is included in the CLIN’s price until such time as the Contracting Officer provides final acceptance of the line item(s).

2. At a minimum, meet monthly with COR to review and approve progress made to full-sized record drawings prior to the submittal for progress payment. Meeting location to be approved by COR.

3. Verify with the COR that mark-ups to the drawings are current with the progress of the work prior to submitting invoice for progress payment.

F. Upon completion of work, and prior to training and/or Government possession, submit to COR for review and acceptance:

1. One set will be maintained by Government:

a. For maintenance of changes to Government provided information drawings.

b. For verification of Final Drawings.

2. Sign marked prints as certified correct:

a. Sign and date each drawing as certified correct. Do not include or certify Information Only drawings, unless changed.

b. If no revisions were necessary to illustrate as-built conditions, mark drawing with "No Change".

c. Provide As-built drawings as outlined in Sections 01 30 00 – Submittals and 01 33 26 – Electrical Drawings and Data.

G. Provide videos, photos, and other pertinent documentation and as requested by COR.

1.05 FINAL DRAWINGS

A. Update all drawings and diagrams either generated by Contractor or impacted by Contractor performed work with all modifications made during design and construction process, including all modifications made during testing. Include all As-built drawing modifications.

B. Drawings shall represent final installed condition of facility at completion turnover of system to Government.

C. Drawings supplied as Final Drawings shall meet requirements of Final Drawings included in Sections 01 33 00 – Submittals.

D. Computer drafted drawings provided in electrical AutoCAD (.dwg) format, compatible with AutoCAD, 2019 or later, and Adobe Acrobat (.pdf) format on Reclamation provided USB or other electric device approved by the Government.

1. Deliverables shall be "eTransmit" from within the Civil 3D application, to package .dwg files with resource files and dependencies including fonts, external references, and images.

2. Topographical drawings shall contain point files, point groups, and intelligent Civil 3D object entities such as surfaces, alignments, profiles, cross-sections, as required. ASCII point files must be included, with a point descriptor glossary.

E. Upon completion, sign prints as certified correct:

1. Sign and date each drawing as certified correct.

2. If no revisions were necessary, mark drawing with "No Changes".

1.06 EXTRA MATERIALS

A. List extra materials provided in accordance with the specifications and Section 01 60 00 – Product Requirements.

B. Provide the list in the following format:

List of Extra Materials				
Specification Section	Material Designation	Material	Manufacturer	Extra Material Item

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CONSTRUCTION DOCUMENTATION

A. Provide and maintain at least 2 copies of As-built Drawings and manufacturer's installation instructions at jobsite upon equipment shipment:

1. Drawings shall be in as-built condition at time of equipment shipment and shall reflect Government approval comments.

B. Mark drawings with changes and revisions made during installation and checkout of equipment following As-built marking procedures:

1. Mark and dimension to show variations between actual construction and that indicated or specified in contract documents.
2. Mark to define construction provided:
   a. Where choice of materials or methods is permitted in specifications.
   b. Where variations in scope or character of methods is permitted in specifications.
   c. Where variations in scope or character of work from that of original contract are authorized.

C. Upon completion of work:

1. Sign marked prints as certified correct.

2. Submit to COR for approval within 28-days following completion of onsite work:
   a. One set to be retained by COR.
   b. One set to be used in preparation of Final Drawings for each project component.

END OF SECTION

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SECTION 01 79 20
TRAINING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

1.02 QUALIFICATIONS

A. Instructor:

1. Factory authorized service representative qualified in providing required training and having expert knowledge of the operation and maintenance of the equipment and associated components.
2. Familiar with the project requirements.

1.03 COORDINATION

A. Coordinate instruction schedule and location with Government. Training shall be accomplished Mondays through Thursdays. Fridays, Saturdays, Sundays, and legal Federal holidays shall be excluded from potential training days.

B. Conduct training during normal working hours until conclusion of training course.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 01 79 20-1, Training Materials:

1. Bound hard copies and digital copies of Training Materials.

1.05 TRAINING COURSE REQUIREMENTS

A. Attendees: Facility personnel at Leavenworth National Fish Hatchery.

B. Course content shall be plant- and equipment-specific and shall include:

1. Overview of how systems interact and function in overall operation of all systems modified by this project.
2. Safety and protection.
3. Control and monitoring for individual equipment, including programming.

4. Operation and maintenance.
5. Testing.
6. Hardware.
7. Software.
8. As-built drawings.
9. Operation and maintenance manual.
10. Major revisions from previous systems.

C. Government has sole ownership of Contractor-provided training material.

D. Training Duration: The training shall consist of sessions not exceeding 8 hours or as required by COR.

E. Dates:

1. Hands-on training no later than 14 days after commissioning valves and radio control systems, or as approved by COR.
2. Coordinate timing of each training session with the COR.

F. Location: Onsite for both classroom training and hands on training.

1. Submit location request to COR at least 14 days in advance. Include details describing intended operational sequences and locations of inspection to determine Government clearance procedures.
2. Use of actual installed equipment for training demonstration to be coordinated with COR.

G. Recording:

1. Provide audio and color video recording of trainings.
2. Provide necessary equipment to record classroom portions of training.
3. Ensure projector screen presentations, white board diagrams, and flip chart paper diagrams developed during class are visible and legible on video recording.
4. Ensure audio for both instructor and class participants is understandable.
5. Use DVD format or other electronic device approved by the Government, suitable for playback on standard equipment available commercially in the United States.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 TRAINING

A. Class Presentation Materials:

1. PowerPoint presentation and handouts.
2. Draft as-built drawings.
3. Operation and maintenance manual.
4. Photos with descriptions of onsite installed equipment.
5. Reclamation reserves the right to reproduce and modify any and all training materials. Training materials shall become the property of the Government after completion of the training.

B. Training shall be provided after commissioning of the equipment.

C. Attendance at each session will not exceed 10.

D. Provide up to 10 copies of bound, hard copy training materials for each training session. Materials for each student shall include detailed and comprehensive manual covering installation, operation, and maintenance.

E. Government will furnish facilities for training and will retain training materials for future reference.

F. Provide necessary laptop and projector to be used for training sessions.

G. Provide video recording equipment and personnel to operate equipment.

END OF SECTION

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DIVISION 02 – EXISTING CONDITIONS

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SECTION 02 41 10
SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Site Demolition:

1. Payment: Lump-sum price offered in the Price Schedule.

   a. Includes:

      1) Demolition of existing reinforced concrete control valve vault.

      2) Demolition of existing control valve sheetmetal shed.

      3) Demolition of Concrete Cylinder Pipe.

      4) Demolition of existing steel pipe wye as shown on drawings.

      5) Debris removal.

      6) Electrical Equipment and components.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 02 41 10-1, Demolition Plan:

1. Submit concurrently with RSN 03 81 10-1, Concrete Removal and Disposal, Concrete Removal and Disposal Plan.

2. Narrative of foundation, equipment, wiring, concrete cylinder pipe, steel wye, and structure to be demolished including photographs.

3. Size and location of the following:

   a. Existing control valve and associated vault.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 EXAMINATION

A. Field verify all dimensions, locations and equipment prior to demolition.

3.02 ELECTRICAL POWER

A. Preserve existing 480 V, three phase electrical branch to existing isolation valve structure for Contractor re-use.

B. After removal of existing isolation valve structure but prior to installation of new contractor-furnished equipment, permit COR to inspect existing 480 V, three phase electrical branch circuits at valve vault site.

3.03 REMOVAL AND DISPOSAL

A. Perform an Asbestos Survey before removing concrete cylinder piping as shown in Section 02 82 20 - Removal and Dispsoal of Asbestos Containing Materials.

B. Remove and dispose of demolished framing, and concrete:

1. For removal and disposal of concrete, see Section 03 81 10 – Concrete Removal and Disposal.
2. Includes, but not limited to the following miscellaneous items:
   a. Ladders.
   b. Electrical wiring and conduit.
   c. Lighting.
   d. Isolation valve, except:
      1) Preserve isolation valve and return to USFWS upon removal, do not dispose of without USFWS approval.

C. Dispose of non-hazardous materials in accordance with Section 01 74 00 – Cleaning and Waste Management.

3.04 PROTECTION

A. Provide protection for personnel and existing facilities from harm due to the Contractor's operations.

B. Arrange protective installations to permit operation of existing equipment and facilities by the Government while work is in progress.

3.05 REMOVAL OF PROTECTIVE INSTALLATIONS

A. Remove protective installations after purpose has been served. Materials furnished by the Contractor to provide protection remain property of the Contractor.

3.06 REPAIR

A. Repair, at Contractor's expense, damage to existing installations due to Contractor's operations or Contractor's failure to provide proper protection.

END OF SECTION

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SECTION 02 80 10
GENERAL REQUIREMENTS FOR HAZARDOUS MATERIALS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost in price offered in the Price Schedule for Asbestos-Containing Material Abatement.

1.02 DEFINITIONS

A. Asbestos: See WAC 296-62-07703.

B. AIHA: American Industrial Hygiene Association.

C. Competent Person: See WAC 296-62-07728.

D. NVLAP: National Voluntary Laboratory Accreditation Program.

E. PFT: Pulmonary Function Tests.

F. PPE: Personal Protective Equipment.

G. Regulated Area: See WAC 296-62-07711.

H. WISHA: Washington Industrial Safety and Health Act.

1.03 REFERENCE STANDARDS

A. Bureau of Reclamation (USBR):

1.	RSHS	Reclamation Safety and Health Standards, See Section 01 35 30 - Safety and Health

B. National Institute of Occupational Safety and Health (NIOSH):

1.	NIOSH 7400-94	Asbestos and Other Fibers by PCM

C. Washington Administrative Code (WAC):

1.	WAC 173-50	Accreditation of Environmental Laboratories
2.	WAC 296-62-07611	Regulated Areas
3.	WAC 296-62-07703	Definitions

4.	WAC 296-62-07711	Permissible Exposure Limits (PEL)
5.	WAC 296-62-07715	Respiratory Protection
6.	WAC 296-62-07728	Competent person
7.	WAC 296-62-07735	Appendix A - WISHA Reference Method - Mandatory
8.	WAC 296-62-07737	Appendix B - Detailed Procedures for Asbestos Sampling and Analysis - Nonmandatory
9.	WAC 296-65	Asbestos Removal and Encapsulation
10.	WAC 296-155	General Safety and Health Provisions

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. Note that submittals 3 through 6 are not required if Asbestos Inspection indicates that asbestos is not present.

C. RSN 02 80 10-1, Qualifications:

1. Competent Person: See 1.05A.
2. Independent Testing Laboratory. See 1.05B.
3. First Aid and CPR Trained Persons.

D. RSN 02 80 10-2, Worker Protection Plan:

1. See 1.06B.

E. RSN 02 80 10-3, Background Test Results:

1. Area monitoring and wipe sample results for asbestos concentrations.
2. Include map indicating location of each sample.

F. RSN 02 80 10-4, Working Level Test Results:

1. Air quality monitoring results for asbestos concentrations by personal employee exposure monitors.
2. Include map indicating location of each sample.

G. RSN 02 80 10-5, Post-construction Test Results:

1. Air quality monitoring results for asbestos concentrations by personal employee exposure monitors.
2. Compare with background test results for increased contaminant levels.

3. Include map indicating location of each sample.

H. RSN 02 80 10-6, Asbestos Clearance Test Results:

1. Clearance testing results from Competent Person.
2. In accordance with 1.06A.

1.05 QUALIFICATIONS

A. Competent Person: Current State of Washington Asbestos Supervisor certification.

B. Independent Testing Laboratory:

1. Registered with WDEQ in accordance with WAC 173-50 and listed here: https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Laboratory-Accreditation.
2. Proficient in analyzing air samples using:
   a. WISHA Method ID-60 as defined in WAC 296-62-07735 or
   b. NIOSH method 7400. Meeting requirements of AIHA for asbestos.

1.06 ADMINISTRATIVE REQUIREMENTS

A. Competent Person:

1. Independent from Asbestos Contractor.
2. Be onsite for duration of asbestos activities.
3. Ensure workers use proper hygiene methods and decontamination procedures.
4. Perform or direct Air Clearance testing, review results and provide results.
5. Available for emergencies.

B. Worker Protection Plan:

1. PPE:
   a. Respirators.
   b. Personal air monitoring equipment.
   c. Personal Protective clothing.
2. Compliance Program for Worker Protection:
   a. Respirator program as required by WAC 296-62-07715.
      1) Exposure Certifications.
      2) Fit for Duty tests for respirator usage: Record of diagnostic test and examination by a Board Eligible or Certified Occupational Medicine Physician.

3. Signed by Project Designer or Asbestos Supervisor.

C. First Aid and CPR Trained Persons:

1. Designate at least 2 persons currently trained in First Aid and CPR to be on site during operations.
2. Immediately available to render first aid when needed, may perform other duties.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 EMISSIONS MONITORING, GENERAL

A. Monitor asbestos levels of following:

1. Air monitoring of emissions using personal employee exposure monitors.
2. Review results by the Competent Person for allowable compliance limits.

B. If Background Test Results are greater than the WISHA PEL for asbestos per WAC 296-62-07705:

1. Notify COR immediately.
2. Stop work and exit area.

3.02 AIR QUALITY MONITORING BY EMPLOYEE EXPOSURE PERSONNEL MONITORS

A. Perform employee exposure monitoring to determine exposure to asbestos in accordance with NIOSH or WISHA analytical sampling methods.

B. Not to exceed WISHA PEL.

C. At the same time that employee exposure monitoring is done, monitor airborne contaminants at boundary of Regulated Areas.

D. If emissions exceed WISHA PEL, stop work until the containment system is corrected to meet required standards.

3.03 CLEARANCE TESTING

A. Collect according to WAC 296-62-07737.

B. Analyze according to WISHA method ID-60 or NIOSH 7400.

END OF SECTION

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SECTION 02 82 20
REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING MATERIALS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Asbestos Inspection:

1. Payment: For the lump-sum offered in the Price Schedule.
   a. Includes:
      1) Certificates.
      2) Asbestos Inspection.

B. Asbestos-Containing Material Abatement:

1. Measurement: Asbestos-Containing Material removed.
2. Payment: Unit price of square feet offered in the Price Schedule.
   a. Includes:
      1) Asbestos Contractor History.
      2) Asbestos Hazard Abatement Plan.
      3) Asbestos abatement and disposal.

1.02 DEFINITIONS

A. ACM: Asbestos-containing materials. See WAC 296-62-07703.

B. AHERA: Asbestos Hazard Emergency Response Act per 40 CFR Part 763.

C. Asbestos: See Section 02 80 10 - General Requirements for Hazardous Materials.

D. CIH: Certified Industrial Hygienist.

E. Good Faith Inspection: As noted in WAC 296-62-07721. Asbestos Inspection per 40 CFR Part 763.85.

F. PE: Professional Engineer.

G. Regulated Area: See Section 02 80 10 - General Requirements for Hazardous Materials Abatement.

H. UBI: Unified Business Identifier.

1.03 REFERENCE STANDARDS

A. Code of Federal Regulations (CFR)

1.	40 CFR Part 763	Toxic Substances Control Act (TSCA): Asbestos
2.	49 CFR Chapter I, Subchapter C	Hazardous Materials Regulations

B. Environmental Protection Agency (EPA)

1.	EPA Method 600-R-93/116	Method for the Determination of Asbestos in Bulk Building Materials

C. Executive Orders (EO)

1.	EO 12088	Federal Compliance with Pollution Control Standards

D. Washington Administrative Code (WAC)

1.	WAC 173-50	Accreditation of Environmental Laboratories
2.	WAC 296-62, Part I-1	General Occupational Health Standards: Asbestos, tremolite, anthophyllite, and actinolite
3.	WAC 296-65	Asbestos Removal and Encapsulation

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. Note that submittals 3 through 6 are not required if the Asbestos Inspection indicates that asbestos is not present.

C. RSN 02 82 20-1, Certificates.

1. See 1.05.
2. AHERA certifications:
   a. Asbestos Building Inspector.
   b. Asbestos Contractor.
   c. Asbestos Supervisor.
   d. Asbestos Project Designer.
   e. Asbestos Workers.
3. Asbestos Project Designer: Current PE license or CIH certification.
4. Independent Testing Laboratory.

5. Solid Waste Disposal Facility include EPA Identification Number, address and telephone number.

6. Transporter, if different from Solid Waste Disposal Facility or Asbestos Contractor, EPA Identification Number. Include contact person, address and telephone number.

D. RSN 02 82 20-2, Asbestos Inspection.

1. See 1.08A.

E. RSN 02 82 20-3, Asbestos Contractor History:

1. Record of citations issued by regulatory agencies relating to asbestos activities. Include project names, dates, and resolutions.

2. List of penalties incurred through non-compliance with asbestos regulations.

3. Termination of asbestos-related contracts. Include project names, dates, and reasons for terminations.

4. If there are none, provide negative declaration.

5. Statement to be signed by company principal.

F. RSN 02 82 20-4, Asbestos Hazard Abatement Plan.

1. See 1.08C.

G. RSN 02 82 20-5, Asbestos Notification of Demolition and Renovation.

1. Copy of form "Notification of Demolition and Renovation" and delivery verification.

H. RSN 02 82 20-6, Certificate of Disposal.

1. Documents that asbestos shipped, received, and properly disposed.

2. In accordance with 1.08B.2.

1.05 SAFETY AND HEALTH REGULATIONS

A. Refer to Section 02 80 10 - General Requirements for Hazardous Materials.

1.06 PROJECT CONDITIONS

A. Facility owner's EPA Identification Number will be provided to Contractor after Notice to Proceed.

1.07 QUALIFICATIONS

A. Asbestos Building Inspector: Current Asbestos Building Inspector certification in accordance with 40 CFR Part 763.

B. Asbestos Contractor:

1. Current Washington Asbestos Contractor certification in accordance with WAC 296-65.
2. Provide current Washington UBI Number.
3. Listed with Washington State Department of Labor and Industries here: https://lni.wa.gov/licensing-permits/other-licenses-permits/asbestos-certification#certified-contractors-list

C. Asbestos Project Designer:

1. Current Asbestos Project Designer certification in accordance with 40 CFR Part 763.
2. Current CIH certification or Washington State PE license.
3. Required if asbestos quantities to be abated exceed the amounts cited in WAC 296-62-07722.

D. Asbestos Supervisor: Current Washington Supervisor certification in accordance with WAC 296-65.

E. Asbestos Workers: Current Washington Class II Asbestos Worker certification in accordance with WAC 296-65.

F. Independent Testing Laboratory:

1. Approved for bulk asbestos analysis using EPA Method 600/R-93/116.
2. Registered with WDEQ in accordance with WAC 173-50 and listed here: https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Laboratory-Accreditation.

G. Solid Waste Disposal Facility: Approved for ACM disposal.

H. Transporter, if different from Solid Waste Disposal Facility or Asbestos Contractor, meet requirements of registration per 49 CFR Chapter I, Subchapter C.

1.08 ADMINISTRATIVE REQUIREMENTS

A. Asbestos Building Inspector: Conduct inspection of area to be disturbed in accordance with 40 CFR Part 763. See photographs at the end of this article which indicate the pipe's protective coating and lining to be investigated:

B. Asbestos Contractor:

1. Fill out Abatement Notice, form "Notification of Demolition and Renovation".
   a. Required when the amount of asbestos to be abated is greater than the amount cited in WAC 296-65-020(1).

b. Send to Washington Department of Ecology Central Regional Office, 1250 West Alder Street, Union Gap, WA 98903-0009 with verifiable delivery.

2. Transportation and Disposal Tasks:

a. Obtain required transportation permits.

b. Manifest per 49 CFR Chapter I, Subchapter C.

C. Asbestos Project Designer:

1. Required if asbestos quantities exceed the amounts cited in WAC 296-62-07722.

2. Develop and sign Asbestos Hazard Abatement Plan.

a. Containment System:

1) Enclosed Containment:

a) Descriptions, detail project drawings, and site layout.

b) Include containment techniques, local exhaust ventilation system locations, decontamination units, temporary waste storage facility, location of temporary utilities, and boundaries of Regulated Areas.

2) Modified containment area: Glove-bag technique.

b. Emissions:

1) Reporting releases.

2) Decontamination of contaminated areas and surfaces.

3) Clearance testing.

c. Waste Handling and Disposal: Handling, storage, transporting, and disposal of project-generated waste and cleaning of reusable items.

D. Asbestos Supervisor:

1. Prepares and signs Asbestos Abatement Plan if asbestos quantities are less than the amounts cited in WAC 296-62-07722.

2. On jobsite during asbestos abatement activity.

3. Ensure engineering controls in use are in proper operating condition and are functioning properly.

Figure 1. View of pipe showing protective coating.

Figure 2. View of protective coating and lining; both need to be sampled and analyzed.

Figure 3. Additional view of piping showing protective coating and lining.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 ASBESTOS INSPECTION

A. Perform in accordance with 1.08A.

3.02 ASBESTOS ABATEMENT AND DISPOSAL

A. In accordance with 1.08.

END OF SECTION

DIVISION 03 – CONCRETE

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SECTION 03 11 10
CONCRETE FORMING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of furnishing and constructing forms in applicable prices offered in the Price Schedule, for concrete items for which forms are required.

1.02 REFERENCE STANDARDS

A. American Concrete Institute

1. ACI 318-19(22)	Building Code Requirements for Structural Concrete and Commentary (Reapproved 2022)

B. APA - The Engineered Wood Association (APA)

1. APA PS 1-09	Structural Plywood

C. Bureau of Reclamation (USBR)

1. RSHS	Reclamation Safety and Health Standards, including revisions posted at http://www.usbr.gov/safety/rshs/index.html

D. Western Wood Products Association (WWPA)

1. WWPA WLGR-2011	Western Lumber Grading Rules 2011

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 03 11 10-1, Formwork Design and Drawings:

1. Include design and drawings for:
   a. Reinforced Concrete Thrust Blocks.
   b. Control Valve Vault (needed if cast-in-place concrete is used for vault).
   c. Flowmeter Vault (needed if cast-in-place concrete is used for vault).

1.04 DESIGN

A. Design formwork as required for structures shown on the drawings.

B. Design formwork in accordance with RSHS.

C. Designs performed by and drawings stamped by registered professional engineer.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 FORM MATERIALS

A. Sheathing or Lining: Conform to Table 03 11 10A - Form Sheathing or Lining Materials, or provide other materials which will produce equivalent results.

Table 03 11 10A - Form Sheathing or Lining Materials

Finish	Wood sheathing or lining	Steel sheathing or lining
F1	Any grade common board or plywood	Steel sheathing permitted Steel lining permitted
F2	No. 2 common or better, shiplap, or plywood	Steel sheathing permitted Steel lining permitted if approved
F3	Plywood	Steel sheathing permitted Steel lining not permitted

B. Steel sheathing is steel sheets not supported by wood backing. Steel lining is thin sheets supported by wood backing.

C. Wood Sheathing or Lining: Softwood or plywood of such kind and quality and treated or coated so that deterioration or discoloration of formed concrete surfaces due to chemical action, contamination, or uneven absorption of water from concrete is prevented.

D. Plywood: APA PS 1, Exterior, Grade B-B Concrete Form, Class I, mill oiled and edge sealed.

E. Softwood Lumber:

1. Meet requirements of WWPA WLGR for dressed lumber or worked lumber of specified grade.
2. Use common boards surfaced on both edges (S2E) in accordance with WWPA WLGR.
3. Use 6- or 8-inch wide lumber for shiplap forms.

4. Use same lumber width in forms for F2 finishes.

F. F3 Finish Forms: Use material with basic modular size of 4 by 8 feet.

G. Aluminum sheathing or formwork is not permitted to be in contact with fresh concrete

3.02 INSTALLATION

A. Construct forms to confine and shape concrete to required lines so that completed work meets specified structural deviations, surface tolerances, and finish requirements.

B. Construct forms with sufficient strength to withstand pressure from placing and vibrating concrete. Maintain in proper position.

C. Adjust formwork design and concrete placing rate to compensate for hydraulic pressures exerted on forms by concrete with high fluidity.

D. Where form vibrators are to be used, construct forms with sufficient rigidity to effectively transmit energy from form vibrators to concrete without damaging formwork or altering form position.

E. Seal surfaces and joints of forms to prevent absorption of water into forms or loss of mortar from concrete.

F. Place chamfer strips in corners of forms and at tops of wall placements to bevel edges of permanently exposed concrete surfaces. Do not bevel interior angles of intersecting concrete surfaces and edges of construction joints except as indicated on drawings.

G. Install sufficient plumb and string lines to monitor formwork positions before concrete placement. Monitor plumb and string lines during concrete placement and correct deficiencies in formwork.

H. F2 Finish:

1. Use one type of form sheathing or lining material for exposed F2 surfaces.
2. Construct forms to produce a uniform and consistent texture and pattern on face of concrete. Metal patches on forms are not permitted.
3. Place form sheathing or lining so that horizontal form marks are continuous across entire surface.
4. For forms constructed of plywood form lining or shiplap panels, make vertical form marks continuous for entire height of surface.
5. For forms constructed of shiplap which is not paneled, cut boards square, stagger vertical joints in boards, and place vertical joints at studs.

I. F3 Finish:

1. Use one type of form sheathing or lining material for F3 surfaces. Fabricate filler panels for corners, soffits, and similar offsets from same material as used for forms.
2. Construct forms to produce a uniform and consistent texture and pattern on face of concrete. Metal patches on forms are not permitted.
3. Align sheathing or lining horizontally and vertically and place to minimize joint marks on surfaces.
4. Place form sheathing or lining so that horizontal form marks are continuous across entire surface.
5. Make vertical form marks continuous for entire height of surface.
6. Fill and smooth finish voids at joints in plywood form lining or sheathing.
7. Do not construct forms continuously from lift to lift. Remove forms after concrete in a lift has hardened and reset forms for next lift.
8. Reset forms to overlap hardened concrete in previous lift by 1 inch, maximum.
9. Tighten forms snugly against hardened concrete so that forms will not spread and cause offsets or loss of mortar at construction joints when concrete placement is resumed. Provide additional bolts or form ties required to hold reset forms tight against hardened concrete.

J. Form Ties and Anchors:

1. Embed ties for holding forms.
2. Terminate ties not less than 2 diameters or twice minimum dimension of tie, whichever is greater, from formed surface of concrete, except where F1 finish is permitted.
3. Install ties so ends or end fasteners can be removed without causing spalling at face of concrete.
4. Provide form anchors as required to ensure that concrete surfaces will meet specified tolerances. Replace form anchors embedded in concrete which are loosened before placement of adjoining concrete with other supports firmly embedded in hardened concrete.

K. Cleaning and Oiling Forms:

1. Clean form surfaces of encrustations of mortar, grout, or other foreign material.
2. Coat form surfaces with form oil which will prevent sticking and will not soften or stain concrete surfaces or cause concrete surface to become chalky or dust producing.

3.03 REMOVAL

A. Remove forms within 24 hours after concrete has gained sufficient strength to prevent damage by form removal.

1. Nonsupporting forms such as sides of beams, walls, columns, and similar items: Remove after cumulatively curing at not less than 50 degrees F for 24 hours from time of concrete placement when:

   a. Concrete is sufficiently hard so as not to sustain damage by form removal operations.

   b. Curing protection is maintained.

2. Forms for elevated structural slabs or beams:

   a. Remove in accordance with ACI 318, Chapter 6.

   b. Do not remove forms until concrete has reached compressive strength of at least 80 percent of specified 28-day compressive strength, as determined by test cylinders.

3. Forms on upper sloping faces of concrete, such as forms on waterside of warped transitions: Remove as soon as concrete has attained sufficient stiffness to prevent sagging.

4. Wood forms for wall openings: Loosen as soon as loosening can be accomplished without damage to concrete to prevent excessive stress in concrete from swelling of forms. Construct forms for openings to facilitate loosening.

B. Do not remove forms until concrete strength is such that form removal will not result in perceptible cracking, spalling, or breaking of edges or surfaces, or other damage to concrete.

C. Remove forms in a manner which prevents damage to concrete.

D. Repair damaged concrete in accordance with Section 03 30 00 - Cast-in-Place Concrete.

E. Begin required repair and curing immediately after form removal.

END OF SECTION

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SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of reinforcing steel in unit price offered in the Price Schedule for Reinforced Concrete.
2. Include cost of reinforcing steel for Control Valve Vault in price offered in the Price Schedule for Control Valve Vault.
3. Include cost of reinforcing steel for Flowmeter Vault in price offered in the Price Schedule for Flowmeter Vault.

1.02 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1.	ACI 315-18	Details and Detailing of Concrete Reinforcement (Part of SP-66-04 ACI Detailing Manual)
2.	ACI 318-19	Building Code Requirements for Structural Concrete and Commentary (Reapproved 2022)

B. ASTM International (ASTM)

1.	ASTM A615/A615M-24	Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
2.	ASTM A706/A706M-24	Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
3.	ASTM A996/A996M-24	Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement
4.	ASTM A1064/A1064M-24	Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 03 20 00-1, Reinforcement Diagrams and Lists:

1. Bar-placing diagrams, bar lists, and bar-bending diagrams required for reinforcement fabrication and placement for each separate item of work.
2. Prepare bar-placing diagrams, bar lists, and bar-bending diagrams in accordance with ACI 315 and drawings.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid rusting.

B. Protect from contaminants such as grease, oil, and dirt.

C. Provide for identification after bundles are broken and tags removed.

PART 2 PRODUCTS

2.01 STEEL REINFORCING

A. Reinforcing Bars and Dowels:

1. ASTM A615, Grade 60; ASTM A706, Grade 60; or ASTM A996, Type A, Grade 60.
2. Deformed steel bar.

2.02 ACCESSORIES

A. Chairs, hangers, spacers, and other supports:

1. Material: Concrete, metal or other approved material.
   a. Compressive strength of precast concrete blocks: Equal to or greater than surrounding concrete.
2. Exposed portions of supports on concrete surfaces designated to receive F2 or F3 finish:
   a. Galvanized, plastic coated, or corrosion-resistant material.
   b. Concrete supports not allowed.

PART 3 EXECUTION

3.01 INSTALLATION

A. Clean reinforcement surfaces of heavy, flaky rust, loose mill scale, dirt; grease, and other foreign substances before placement.

B. Field bending not allowed unless approved by COR.

1. Do not use heat to bend.

C. Do not use torch to cut.

D. Accurately place reinforcement:

1. Place reinforcement as shown on drawing 40-D-60003, unless otherwise shown on reinforcement design drawings.
2. Unless otherwise prescribed, placement dimensions shall be to the centerline of the bars.
3. Place reinforcement with a clear distance of 1 inch, minimum, between reinforcement and anchor bolts, form ties, or other embedded metalwork unless otherwise shown on drawings.

E. Splices:

1. Locate where shown on drawings, unless otherwise approved by COR.
2. Reinforcement may be spliced at additional locations for the convenience of the Contractor, subject to approval of COR.

F. Do not weld or tack weld reinforcing bars, except at locations shown on the drawings or where approved by COR.

G. Secure reinforcement in place so that it will not be displaced during concrete placement.

H. Do not disturb reinforcement in concrete that has been placed.

I. Tolerances:

1. Maintain concrete cover over reinforcement within 1/2 inch of specified cover where specified cover is greater than 2-1/2 inches.
2. Maintain concrete cover over reinforcement within 1/4 inch of specified cover where specified cover is 2-1/2 inches or less.
3. Maintain spacing of reinforcing bars within 1 inch of required spacing.

END OF SECTION

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Reinforced Concrete:

1. Measurement: Volume of Concrete measured to structure neatlines shown on drawings.
2. Payment: Cubic yard unit price offered in the Price Schedule.
   a. Includes:
      1) Thrust Blocks as shown on drawings.
      2) Reinforcing steel.

B. Cost:

1. Include cost of cast-in-place concrete for Equipment Vaults in price offered in the Price Schedule for Control Valve Vault and Flowmeter Vault.
   a. See Section 33 05 30 – Equipment Vaults, paragraph 2.01.

1.02 ACRONYMS

A. NRMCA: National Ready Mixed Concrete Association.

1.03 DEFINITIONS

A. Supplementary Cementitious Materials (SCM): Cementitious materials other than portland cement.

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI)

1.	ACI 201.2R-23	Guide to Durable Concrete
2.	ACI 301-20	Structural Concrete
3.	ACI 304R-00(2009)	Guide for Measuring, Mixing, Transporting, and Placing Concrete
4.	ACI 305.1-14	Hot Weather Concreting
5.	ACI 306.1-90(2002)	Cold Weather Concreting

6.	ACI 318-19	Building Code Requirements for Structural Concrete (Reapproved 2022)

B. ASTM International (ASTM)

1.	ASTM C31/C31M-25b	Making and Curing Concrete Test Specimens in the Field
2.	ASTM C33/C33M-24a	Concrete Aggregates
3.	ASTM C39/C39M-24	Compressive Strength of Cylindrical Concrete Specimens
4.	ASTM C42/C42M-20	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
5.	ASTM C94/C94M-25	Ready-Mixed Concrete
6.	ASTM C114-24	Chemical Analysis of Hydraulic Cement
7.	ASTM C117-23	Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
8.	ASTM C136-19	Sieve Analysis of Fine and Coarse Aggregates
9.	ASTM C138/C138M-24a	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
10.	ASTM C143/C143M-20	Slump of Hydraulic-Cement Concrete
11.	ASTM C150/C150M-24	Portland Cement
12.	ASTM C157/C157M-24e1	Length Change of Hardened Hydraulic-Cement Mortar and Concrete
13.	ASTM C171-20	Sheet Materials for Curing Concrete
14.	ASTM C231/C231M-24	Air Content of Freshly Mixed Concrete by the Pressure Method
15.	ASTM C260/C260M-24	Air-Entraining Admixtures for Concrete
16.	ASTM C309-19	Liquid Membrane-Forming Compounds for Curing Concrete
17.	ASTM C494/C494M-24	Chemical Admixtures for Concrete
18.	ASTM C566-19	Total Evaporable Moisture Content of Aggregates by Drying
19.	ASTM C595/C595M-25	Blended Hydraulic Cements
20.	ASTM C618-25a	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
21.	ASTM C920-18(2024)	Elastomeric Joint Sealants

22.	ASTM C989/C989M-25	Slag Cement for Use in Concrete and Mortars
23.	ASTM C1064/C1064M-23	Temperature of Freshly Mixed Hydraulic-Cement Concrete
24.	ASTM C1240-20	Silica Fume Used in Cementitious Mixtures
25.	ASTM C1260-23	Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
26.	ASTM C1293-23ae1	Determination of Length of Change of Concrete Due to Alkali-Silica Reaction
27.	ASTM C1567-25	Determining the Potential Alkali-Silica Reactivity of Combination of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
28.	ASTM C1602/C1602M-22	Mixing Water Used in the Production of Hydraulic Cement Concrete
29.	ASTM D1751-23	Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

C. Bureau of Reclamation (USBR)

1.	USBR M-47	Standard Specifications for Repair and Maintenance of Concrete, August 2015 (Part 2 of "Guide to Concrete Repair"
2.	USBR Concrete Manual	Concrete Manual, Eighth Edition, Revised Reprint, 1981

D. U.S. Army Corps of Engineers (COE)

1.	COE CRD-C 662-10	Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar-Bar Method)

E. International Concrete Repair Institute (ICRI)

1.	ICRI 310.2-13	Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays and Concrete Repair

F. Underwriter's Laboratories Inc. (UL)

1. UL 2079-04 Tests for Fire Resistance of Building Joint Systems

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 03 30 00-1, Approval Data:

1. Mix Design: For each concrete mix.
   a. Mixture proportions.
   b. Material sources.
      1) Name and manufacturer of each cementitious material.
      2) Name of aggregate source(s).
      3) Product name and manufacturer of admixtures to be used in mix.
         a) The manufacturer shall certify that all admixtures contain no purposefully added chlorides and that the chloride ion content of the admixtures in the quantities proposed is below the limits given by ACI 201.2 (0.01percent by mass of cementitious material). The Government reserves the right to require submission of samples of concrete materials for testing before or during use in concrete.
   c. Physical properties:
      1) Compressive strength: Test data shall meet the requirements of ACI 301, paragraph 4.2.3.4.
         a) Field test data: Performed within past 24 months.
         b) Trial mixtures:
            i. Incorporate admixtures that will be used in production mixes into trial mixes.
            ii. Results from trial batches made within past 6 months.
            iii. Trial mix test results, three, six-inch diameter cylinders each at 7, and 28, and 56 days.
            iv. Average compressive strength of trial batch cylinders at specified design age.
   d. Resubmit mix design for change in material source or type.
2. Name and manufacturer of curing compounds, and joint filler.
   a. Include application instructions for curing compound.
3. Certifications and Test Reports:

a. Sealed by Professional Engineer.

b. Certifications and test reports:

1) Cementitious Materials Certification and Test Reports

a) Less than 3 months old.

2) Aggregate producer for:

a) ASTM C33 physical properties.

b) ASR testing reports for each aggregate source.

c) Less than 12 months old.

3) Mixing water for concrete shall comply with ASTM C1602.

c. Submittal of certifications and test reports shall not relieve Contractor of responsibility for furnishing materials meeting specified requirements.

C. RSN 03 30 00-2, Concrete Placement Drawings:

1. Drawings for individual concrete placements. More than one placement may be shown on a drawing.

a. An individual concrete placement is defined as a portion of concrete work placed in one continuous operation between specified lines or joints.

b. List contract drawing(s) from which details for placement were obtained.

c. Show locations, elevations, dimensions, blockouts, openings, recesses, waterstops, and finishes.

d. Show details of items embedded in or associated with placement except reinforcing steel.

e. Reference related reinforcement drawing(s) associated with placement.

2. Include separate drawing(s) showing placement sequence.

3. Identify proposed changes to joint locations.

D. RSN 03 30 00-3, Concrete Placement Schedule:

1. Complete, detailed concrete placement schedule showing plan for individual placements including placement of reinforcement and embedded items.

2. Detail as necessary to show location, sequence, and date of concrete placements scheduled for each item of concrete work.

3. Show submittal schedule for placement and reinforcement drawings.

E. RSN 03 30 00-4, Certifications:

1. NRMCA Certification of Production Facilities. Current NRMCA certification shall include automatic digital recording of cementitious materials, aggregate,

water, and chemical admixtures. Certification shall remain current for the duration of the project.

2. ACI Aggregate Testing Technician certifications.

3. Resume for flatwork foreman with at least 5 years of experience with similar type placements.

4. ACI Concrete Field Testing Technician certifications.

5. ACI Concrete Strength Testing Technician certifications.

F. RSN 03 30 00-5, Pre-placement Inspection Placement Cards:

1. Prior to each placement, submit to COR, a placement card signed by authorized personnel, certifying that formwork, dimensions, reinforcing steel, embedments, RSMC temperature control (if specified) conform to project documents.

G. RSN 03 30 00-6, Test Reports:

1. Aggregate test results as required by Table 03 30 00B - Contractor Batch Plant Quality Testing within 24 hours of completion of testing.

2. Concrete test reports as required by Table 03 30 00E- Contractor Field Quality Testing within 24 hours of completion of testing.

1.06 QUALIFICATIONS

A. Ready Mix Plant: Currently certified by NRMCA. NRMCA certification shall include automatic digital recording of cementitious materials, aggregate, water, and chemical admixtures. Certification shall remain current for the duration of the project.

B. ACI Aggregate Testing Technician: Currently certified ACI Aggregate Testing Technician - Level 1.

C. Flatwork foreman with at least 5 years of experience with similar type placements.

D. ACI Concrete Field Testing Technician: Currently certified ACI Concrete Field Testing Technician - Grade I.

E. ACI Strength Testing Technician: Currently certified ACI Strength Testing Technician.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Sponge Rubber Joint Filler Storage:

1. Store in protected area at temperature of 70 degrees F (21 degrees C) or less.

2. Do not expose to direct sun.

1.08 PRE-PLACMENT MEETING

A. At least 14 days before first concrete placement for first placement, meet with COR for pre-placement meeting.

B. Coordinate time and place of meeting with COR at least 14 days before meeting.

C. Contractor attendees shall be at least the following:

1. Contractor onsite supervisor.
2. Concrete forming, placing, and finishing onsite supervisor(s); Contractor or subcontractor(s) employee as applicable.
3. Technical specialist from ready-mix supplier.
4. Concrete pump subcontractor onsite supervisor, if applicable.
5. Testing agency onsite supervisor(s).

PART 2 PRODUCTS

2.01 CEMENTITIOUS MATERIALS

A. Portland Cement:

1. ASTM C150, Type I/II.
   a. Meet equivalent alkalies (Na2O + 0.658K2O) of 0.60% maximum.
      1) Low-alkali limitation for portland cement may be waived when tests of concrete aggregate source show that low-alkali cement is not required for ASR mitigation. See Concrete Aggregate Materials article (2.03).
   b. Meet false-set requirements of ASTM C150 - Table 4.

B. Blended Hydraulic Cement: ASTM C595, Type IP, IS, IT, IL.

1. Shall meet the low reactivity option in ASTM C595 and achieve the requirements listed in Section 2.03.C regarding ASR mitigation.
2. Meet equivalent alkalies (Na2O + 0.658K2O) of 0.60 percent maximum. Meet equivalent alkali's requirement of ASTM C595, Table 2, Option G or Table 3

C. SCM:

1. Pozzolan:
   a. ASTM C618, Class F or N.
      1) Except:
         a) Sulfur trioxide, maximum: 4.0 percent.

a) Loss on ignition, maximum: 2.5 percent (Class F) or 3.0 percent (Class N).

b)

2) In addition:

a) Calcium oxide, maximum: 8.0 percent.

b) Pozzolan will have an "R" factor less than 2.5. Pozzolan with this "R" factor will not decrease sulfate resistance of concrete.

i. R: (C-5)/F.

ii. C: Calcium oxide content of pozzolan in percent determined in accordance with ASTM C114.

iii. F: Ferric oxide content of pozzolan in percent determined in accordance with ASTM C114.

2. Slag Cement:

a. ASTM C989, Grade 120.

3. Silica Fume:

a. ASTM C1240.

b. Meet optional physical requirements of ASTM C 1240, Table 3.

2.02 WATER

A. ASTM C1602, including optional requirements of Table 2.

2.03 AGGREGATE MATERIALS

A. Fine Aggregate: ASTM C33.

1. Percent Material Passing No. 200 Sieve: Less than 3 percent.

B. Coarse Aggregate: ASTM C33, Class 4S, Size No. specified in Table 03 30 00A - Concrete Mixes.

C. Alkali Silica Reaction (ASR).

1. Test fine and coarse aggregates in accordance with ASTM C1260 for potential deleterious alkali-silica reaction.

a. For ASTM C1260, and other tests when required, continue readings for 28 days after the zero readings.

b. Acceptance criteria specified below are based on 28 day readings after the zero readings.

c. Expansion is no greater than 0.10 percent:

1) Aggregates are acceptable.

d. Expansion is greater than 0.10 percent:

1) Test aggregates according to ASTM C1567 using proposed components (e.g. coarse aggregate, fine aggregate, cementitious materials, and Alkali Silica Reaction (ASR) inhibiting admixtures) in proportions proposed for mixture design.

a) For mixes using lithium admixtures use test procedure COE CRD-C 662.

b) Expansion of proposed mixture design test specimens, tested in accordance with ASTM C1567 does not exceed 0.10 percent:

i. Aggregates are acceptable.

c) Expansion of proposed mixture design test specimens is greater than 0.10 percent:

i. Aggregates are not acceptable unless adjustments to mixture design can reduce expansion to less than 0.10 percent, or testing by ASTM C1293 indicates aggregates will not experience deleterious expansion.

2. ASTM C1293 test results may be substituted for ASTM C1260 test results:

a. Less than 3 years old.

b. Average ASTM C1293 concrete prism expansion less than 0.04 percent at one year: Aggregates acceptable.

c. Average ASTM C1293 concrete prism expansion greater than 0.04 percent at one year: Aggregates not acceptable.

2.04 ADMIXTURES

A. Air-entraining Admixture: ASTM C260.

B. Chemical Admixtures:

1. Do not use chemical admixtures which contain more than 0.1-percent chloride, by weight.

2. Admixtures shall be compatible with each other.

3. Allowable Chemical Admixtures:

a. ASTM C494, Type A, D, F, G, or S.

b. ASTM C494, Type C and E, provided they do not contain chlorides.

C. Specialized Chemical Admixtures:

1. When the batch plant has not previously used a specialized chemical admixture, the admixture manufacturer shall provide an on-site representative to assist with mix design and to train batch plant personnel in dispensing and mixing operations.
2. Do not use specialized chemical admixtures which contain more than 0.1-percent chloride, by weight.
3. Extended Set Control Admixture:
   a. MasterSet Delvo hydration controlling admixture manufactured by Master Builders Solutions. https://www.master-builders-solutions.com/en; or equal, with the following essential characteristics:
      1) Meets ASTM C494, Type B.
      2) Retards setting.
      3) Does not reduce concrete strength.
   b. Use within manufacturer's time limits.
   c. Dispense admixture in presence of COR. Include admixture on the batch ticket.
   d. Admixture quantity required to stabilize concrete shall be pre-determined using jobsite materials. Initial concrete setting time shall be monitored and adjusted during the project by a qualified concrete technician.

2.05 CURING MATERIALS

A. Water: ASTM C1602, including optional requirements of Table 2.

B. Curing Compound: ASTM C309, Type 1 or 1-D, Class B:
   1. Capable of meeting moisture retention at manufacturer's application rate.
   2. Meet Federal, state, and local regulations for VOCs.

C. Sheet Materials:
   1. Polyethylene Film: ASTM C171, clear.

2.06 ACCESSORIES

A. Sponge rubber joint filler:
   1. ASTM D1752, Type I, except:
      a. Test specimen compression load: 50 to 150 lb/in^2.
   2. Joint filler adhesive: Nonbituminous adhesive recommended by filler manufacturer.

B. Elastomeric Sealant: ASTM C920, polyurethane, Use M, Grade NS, Class 25.

C. Evaporation Control:

1. MasterKure® ER 50 manufactured by Master Builders Solutions. https://www.master-builders-solutions.com/en; or equal having the following essential characteristics:

   a. Monomolecular film forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

   b. For application after finishing and prior to applying curing compound.

   c. For use when the evaporation rate is high.

2. Do not use as a finishing aid.

2.07 MIX

A. Design and adjust concrete mix.

1. The Government reserves the right to adjust mix proportions when need for adjustment is indicated by results of materials testing.

   a. When required, adjustment of mix proportions by the Government will be in accordance with USBR Concrete Manual.

B. Cementitious Materials Options:

1. Specified portland cement plus specified pozzolan by percent weight specified in Table 03 030 00A - Concrete Mixes.

2. Specified portland cement plus specified slag cement by percent weight specified in Table 03 03 00A - Concrete Mixes.

3. Blended Hydraulic: ASTM C595 provided, specified portland cement with percent of specified pozzolan or specified slag cement specified in Table 03 03 00A - Concrete Mixes.

C. Design concrete mixes in accordance with Table 03 30 00A - Concrete Mixes. General concrete mix shall be used for concrete unless otherwise specified.

1. Net water-cementitious materials ratio (w/c) is maximum, by weight. Cementitious material weight is cement plus SCM.

2. Slump at Point of Placement: In accordance with ASTM C143.,

3. Air Entrainment: Percent air by volume of concrete as discharged at point of placement, in accordance with ASTM C231.

Table 03 30 00A - Concrete Mixes

Mix No	Feature	f'c (pounds per square inch)	Max w/c*	NMSA**	Percent SCM*** A: Class F Pozzolan B: Slag Cement C: Silica Fume	Slump or Slump flow	Air Content	Notes
1	Structural Concrete not otherwise specified	4500 at 28 days	0.45	No. 57 or 67	A: 20 plus or minus 5 B: 30 plus or minus 10	2 to 4	4.5 to 7.5	1, 2
2	High Slump Structural Concrete	4500 at 28 days	0.45	No. 57 or 67	A: 20 plus or minus 5 B: 30 plus or minus 10	4 to 7	4.5 to 7.5	1, 2

*Maximum water/cementitious materials ratio.
**Nominal Maximum Size Aggregate.
*** SCM as percent of total cementitious material, by weight. Applies only when ASTM C150 cement is utilized. If ASTM C595 cement is utilized, the requirements listed in Section 2.03.C regarding ASR mitigation shall be met.

NOTES:
1 Ternary blended cementitious materials which meet the specifications may be submitted for approval.
2 Concrete with ASTM C1017, Type I or II plasticizing admixtures, ASTM C494 Type F high-range water-reducing admixtures, or Type G high-range water-reducing and retarding admixtures:
i. Admixture shall be incorporated into trial batch or historical data.
ii. Use slump appropriate for placing conditions.

D. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field performance methods as specified in ACI 301. For the trial batch method, mix shall be proportioned and stamped by a professional engineer.

E. Concrete Trial Mixes:

1. Average Compressive Strength of Trial Batch Cylinders at Design Age: Design strength plus 1,200 lbs/in^2 for concrete between 3,000 and 5,000 psi, 1.10F'$_C$ plus 700 psi for concrete with specified design strength greater than 5,000 psi or field data meeting the over design requirements of ACI 318.

2. Admixtures to be used in mix shall be incorporated into mix design submitted for approval.

3. Air Content: Within 1-percent of top of specified range.

4. Slump: Within 1 inch of top of specified range.

2.08 BATCHING, MIXING, AND TRANSPORTING

A. Batch plant shall be currently NRMCA certified with automatic digital recording of cementitious materials, aggregate, water, and chemical admixtures.

B. Manufacture and deliver in accordance with ASTM C94 and ACI C304R.

1. Prepare batch ticket in accordance with ASTM C94 for every batch of concrete.

C. Cold Weather: When air temperature has fallen to or is expected to fall below 40 degrees F, prepare ingredients and mix in accordance with ACI 306.1.

1. Do not use frozen materials or materials containing ice or snow.

2. Uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees.

D. Hot Weather: When precautions are necessary, prepare ingredients and mix in accordance with ACI 305.1.

1. Cool ingredients before mixing to maintain specified maximum concrete temperature at time of placement.

2. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Ice replacing batch water shall be melted prior to discharge.

3. Using liquid nitrogen to cool concrete is Contractor's option with approval from COR.

E. Prevent appreciable segregation of ingredients.

F. Place concrete within 90 minutes from introduction of cement to water or aggregates.

1. For placing times exceeding 90 minutes, extended set control admixtures may be used when approved by COR.

2.09 CONCRETE TEMPERATURE

A. Concrete Temperature at Placing:

1. 50 to 90 degrees F (10 to 32 degrees C).

2.10 CONTRACTOR QUALITY TESTING

A. Contractor shall perform sampling, testing, and reporting as required in Table 03 30 00B - Batch Plant Testing.

1. Personnel conducting tests under this section: Qualified as ACI Aggregate Testing Technician, Level 1; or equal.

B. Perform tests at least as often as the frequencies specified in Table 03 30 00B - Batch Plant Testing.

C. Notify COR immediately of test results showing failure of materials to meet specifications. Provide test results to COR within 24 hours. Submit reports of test results as specified.

2.11 GOVERNMENT CONTRACT QUALITY ASSURANCE - SOURCE

A. In addition to specified Contractor Quality Testing, the Government may also perform the tests listed in Table 03 30 00B - Batch Plant Testing.

2.12 BATCH PLANT TESTING

Table 03 30 00B - Batch Plant Testing

TESTS OF	TEST STANDARD	STANDARD TITLE	REQUIREMENT	TESTING FREQUENCY
Aggregate Gradation	ASTM C136	Sieve Analysis of Fine and Coarse Aggregates	Fine and Coarse Aggregate meets sizing requirements per ASTM C33.	At beginning of placing each mix. At change in mix design. At least every 100 yd^3 of placing a mix.
Aggregate Fines content	ASTM C117	Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing	Fine aggregate meet specified allowable fines content (material passing No. 200 sieve)	At beginning of placing each mix. At change in mix design. At least every 100 yd^3 of placing a mix.
Aggregate moisture content	ASTM C566	Total Evaporable Moisture Content of Aggregate by Drying	Verify that moisture meter at batch plant is accurate with the material batched.	At beginning of placing each mix. At change in mix design. At least every 100 yd^3 of placing a mix.

PART 3 EXECUTION

3.01 PREPARATION

A. Remove standing water, mud, and debris from foundation surfaces to be covered by concrete.

B. Prepare rock surfaces free from oil, objectionable coatings, and loose, semidetached, and unsound fragments. Immediately before placement of concrete, wash rock surfaces with an air-water jet and dry to a uniform surface-dry condition.

C. Prepare earth foundations free from frost or ice.

D. Thoroughly moisten surfaces of absorptive foundations to be covered with concrete so that moisture will not be drawn from fresh concrete. Keep subgrade moisture uniform without puddles or dry areas.

E. Clean, roughen, and surface dry surfaces of construction joints to be covered with fresh concrete.

1. Remove laitance, loose or defective concrete, coatings, sand, curing compound, and other foreign material.
2. Sandblast, steel shotblast, or high-pressure water jet surfaces, or use other method approved by COR to create a surface equivalent to or larger than CSP 5 in accordance with ICRI 310.2.
3. Wash surface thoroughly, and surface dry immediately before placement of adjoining concrete.

3.02 PLACING

A. Notify COR at least 24 hours before placing concrete.

B. Do not place concrete without approval of COR.

C. Place concrete in presence of COR.

D. Place concrete under the direct supervision of a qualified flatwork foreman.

E. Allow at least 7 days between adjacent placements, or as approved by COR.

F. Furnish legible and digitized batch ticket with each batch of concrete in accordance with ASTM C94. Ticket shall include additions made to the load after batching (water, air adjustment, admixtures). Deliver ticket to COR at jobsite during batch delivery.

G. Do not use aluminum pipes and chutes for placing or pumping concrete.

H. Adding water to concrete batch at the site will be allowed only once and only when approved by the COR.

1. Additional water shall be added before concrete is discharged.
2. Do not exceed specified water to cement ratio.
3. After water is added, concrete shall be mixed for at least 30 revolutions of the mixer drum at mixing speed.
4. Record added water on the batch ticket to nearest gallon.

I. Adding air entraining admixtures to concrete batch at the site will be allowed only once when approved by the COR.

1. After air entraining admixture is added, concrete shall be mixed for a minimum of 30 revolutions of the mixer drum at mixing speed.
2. Take slump and air content after air-entraining admixture addition and additional revolutions.
3. Record added air entraining admixture on the batch ticket to nearest ounce.

J. Do not use concrete which has become so stiff that concrete cannot be properly placed.

K. Place formed concrete in continuous, approximately horizontal layers. Do not exceed 20 inches in depth of layers.

L. Vibrate concrete until concrete has been consolidated to maximum practical density, is free from pockets of coarse aggregate, and closes snugly against surfaces of forms and embedded materials. Do not use vibrators to move concrete within forms.

M. Hot Weather:

1. Place concrete in accordance with ACI 305.1.
2. Protect reinforcing steel so that steel temperature does not exceed ambient air temperature immediately before placing concrete.
3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.

N. Cold Weather:

1. Place concrete in accordance with ACI 306.1.
2. Do not place concrete on frozen subgrade or subgrade containing frozen materials.

3.03 FINISHING

A. Notify COR before finishing concrete.

B. Finish concrete in presence of Government inspector unless inspection is waived in each specific case.

C. Finishing for the placements shall be performed under the direct supervision of a qualified flatwork foreman.

D. Finish surfaces as specified in Table 03 30 00F- Formed Surfaces and Table 03 30 00G- Unformed Surfaces.

E. Where finishes are not specified for a particular surface, finish concrete as specified for similar work.

F. Formed Surfaces:

1. Finish class is designated by symbols F1, F2, and F3.
2. Finish F1:
   a. Applies to formed surfaces to be covered by fill material, grout, or concrete, and construction joint surfaces as specified in Table 03 30 00F - Formed Surfaces.
   b. Protect form tie rod ends on surfaces in contact with fill material from moisture where they will be below the water table or waterline.

1) Recess tie rod ends and fill recess with dry pack or other material approved by COR.

c. Cut off flush with formed surface form tie rod ends on surfaces in contact with concrete or fill material and above maximum water table or waterline elevation.

3. Finish F2:

a. Applies to exposed formed surfaces not permanently concealed by fill material, grout, or concrete, and not required to receive finish F3, and to contraction joint surfaces and expansion joint surfaces as specified in Table 03 30 00F- Formed Surfaces.

1) Recess tie rod ends and fill recess with dry pack or other material approved by COR.

4. Finish F3:

a. Applies to formed surfaces with special appearance requirements, such as surfaces exposed to view, as specified in Table 03 30 00F - Formed Surfaces.

b. After required patching and correction of imperfections has been completed, sack rub surface as follows:

1) Thoroughly wet surface and sack rub while surface is still damp.

2) Use mortar consisting of 1 part cement; 2 parts, by volume, of sand passing a No. 16 screen; and enough water so that mortar has consistency of thick cream. Blend standard cement with white cement as necessary to obtain a color which will match surrounding concrete surface.

3) Thoroughly rub mortar over area with clean burlap or a sponge rubber float to fill pits, bugholes, and other defects.

4) While mortar in pits is still plastic, rub surface with a dry mix of above proportions and material to remove excess plastic material and place enough dry material in the pits to stiffen and solidify mortar so that filling will be flush with surface. Remove material remaining on surface except material within pits.

5) Continue curing surface as specified.

G. Unformed Surfaces:

1. Do not use dry portland cement or additional water during finishing.

2. Do not use "jitterbugs" or other tools to force coarse aggregate away from surface.

3. Finish class is designated by symbols U1, U2, U3, or broom finish.

4. Finish U1 (Screeded Finish):

a. Applies to unformed surfaces to be covered by fill material, grout, or concrete as specified in Table 03 30 00G - Unformed Surfaces.

b. Use as first stage of finish U2 and U3.

c. After concrete is placed and consolidated, strike off and level concrete to produce even uniform surface.

5. Finish U2 (Floated Finish):

a. Applies to unformed surfaces not permanently concealed by fill material, grout, or concrete, and not required to receive finish U3, as specified in Table 03 30 00G - Unformed Surfaces.

b. Begin floating as soon as screeded surface has sufficiently stiffened and bleed water sheen has disappeared.

c. Use hand- or power-driven equipment.

d. Finish surface with minimum floating necessary to produce a surface that is free of screed marks and is uniform in texture.

e. Use as second stage of finish U3. Floating shall bring a small amount of mortar without excess water to the surface, so as to permit effective troweling.

6. Finish U3 (troweled finish):

a. Applies to unformed surfaces where appearance and porosity is considered by Government to be of special importance as specified in Table 03 30 00G - Unformed Surfaces.

b. Begin steel troweling after bleed water has disappeared and floated surface has sufficiently hardened to prevent an excess of fine material from being drawn to surface.

c. Trowel with firm pressure to flatten sandy texture of floated surface.

d. Trowel to a dense uniform surface free from blemishes and trowel marks. Do not excessively trowel surface.

7. Broomed Finish:

a. Apply light broom finish in direction with slope immediately after concrete receives U2 finish.

b. Edge transverse joints before brooming.

c. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic with adjacent strokes slightly overlapping.

d. Finished surface shall have a uniform appearance and shall be free of abrupt corrugation exceeding 1/8 inch in depth.

e. Brooming shall eliminate the flat surface left by the surface face of the edger.

8. Slope interior surfaces for drainage where shown on drawings or as determined by COR. Slope surfaces exposed to the weather for drainage as determined by COR.

9. Slope narrow surfaces, such as tops of walls and curbs, approximately 3/8 inch-per foot of width, unless use of other slopes or level surface is indicated on drawings or is determined by COR.

a. Slope broader surfaces; such as walks, platform, and decks; approximately 1/4 inch-per foot unless use of other slopes or level surfaces is indicated on drawings or is determined by COR.

3.04 JOINTS AND EDGES

A. Construction Joints (CJ):

1. Construction joints are joints which are purposely placed in concrete to facilitate construction, reduce initial shrinkage stresses and cracks, allow time for installation of embedded metalwork, or allow for subsequent placing of other concrete.

2. Bond is required at construction joints regardless of whether or not reinforcement is continuous across joint.

3. Locate construction joints where shown on drawings. Relocation, addition, or elimination of construction joints will be subject to approval by the Engineer of Record.

4. Clean, roughen, and surface dry surfaces of construction joints to be covered with fresh concrete. See Preparation article.

5. Do not use a mortar layer on construction joints.

B. Contraction Joints (Cr.J):

1. Contraction joints are joints placed in concrete to provide for volumetric shrinkage of a monolithic unit or movement between monolithic units.

2. Construct contraction joints so no bond exists between concrete surfaces forming the joint.

a. Construct contraction joints by placing concrete on one side of joint and allowing it to set before concrete is placed on other side of joint.

b. Coat surface of concrete first placed at contraction joint with curing compound that prevents bond before placing concrete on other side of joint.

3. Except as provided for dowels, reinforcement is not continuous across a contraction joint.

C. Control joints (Ct.J):

1. Control joints are joints placed in concrete to provide for control of initial shrinkage stresses and cracks of monolithic units.

2. Construct control joints so no bond exists between concrete surfaces forming the joint.

   a. Construct control joints by placing concrete on one side of joint and allowing it to set before concrete is placed on other side of joint.

   b. Coat surface of concrete first placed at control joint with curing compound that prevents bond before placing concrete on other side of joint.

   c. Reinforcement is continuous across tooled or saw cut control joints.

D. Expansion Joints (EJ):

1. Expansion joints as shown on drawings:

   a. Form joint in concrete.

   b. Fill joint with neoprene sponge rubber joint filler.

   c. Butt sections of filler with tight-fitting butt joints.

E. Edges:

1. Permanently exposed concrete, except slabs and top edges of curbs: Chamfer edges with a 45 degree bevel 3/4- by 3/4 inch; unless otherwise shown on drawings.

2. Exposed Edges of Slabs and Top Edges of Curbs: Tool to a radius of 1/4 inch unless shown otherwise on drawings.

F. Preformed joints consisting of plastic or metal strips not allowed.

3.05 STRUCTURAL DEVIATIONS AND SURFACE TOLERANCES

A. Structural deviations are defined as allowable variations from specified lines, grades, and dimensions.

B. Surface tolerances are defined as maximum allowable magnitude of surface irregularities.

C. Specified structural deviations and surface tolerances are consistent with modern construction practice and governed by effects that permissible variations may have upon a structure. COR reserves the right to diminish specified structural deviations and surface tolerances where such variations impair structural action, operational function, or architectural appearance of a structure or portion of structure.

D. Construct concrete within stated variations even though more than one may be specified.

1. Specified variation for one element of a structure will not apply when it will permit another element of same structure to exceed its allowable variation.
2. Where variations are not specified or shown on drawings for a particular structure, variations shall be those specified for similar work. As an exception to clause at FAR 52.236-21, Specifications and Drawings for Construction, specific tolerances shown on drawings in connection with any dimension shall govern.

E. Structural Deviations:

1. Check variations from specified lines, grades, and dimensions in hardened concrete to determine that structures are within specified tolerances in Table 03 30 00C - Deviations from Specified Lines, Grades, and Dimensions.
2. Variation is distance between actual position of structure or any element of structure and specified position in plan for structure or particular element.
   a. Plus or minus variations, shown as +/-, indicate a permitted actual position up or down and in or out from specified position in plan.
   b. Variations not designated as (+) or (-) indicate maximum deviation permitted between designated successive points on completed element of construction.
3. Specified position in plan is defined as lines, grades, and dimensions described in these specifications, shown on drawings, or prescribed by COR.

Table 03 30 00C- Deviations From Specified Lines, Grades, and Dimensions

A. STRUCTURES	
1. Footings:	
(a) Variation in length and width dimensions from those specified.	Minus 1/2 inch Plus 2 inches
(b) Horizontal misplacement or eccentricity:	2 percent of footing width in direction of misplacement, but not more than 2 inches
(c) Reduction in thickness from that specified	5 percent of specified thickness, not to exceed 1 inch

Table 03 30 00C- Deviations From Specified Lines, Grades, and Dimensions

2.	Variation from plumb or specified batter for lines and surfaces of walls:	
(a)	When overall height of line or surface is:	
	Less than 10 feet	plus or minus 1/4 inch
	10 feet or more	plus or minus 3/8 inch
(b)	For any two successive intermediate points on the line or surface separated by:	
	10 to 20 feet, inclusive	1/4 inch
	More than 20 feet	3/8 inch
3.	Variation from level or specified grades for slabs:	
(a)	When overall length of line or surface is:	
	Less than 10 feet	plus or minus 1/4 inch
	10 to 20 feet, inclusive	plus or minus 3/8 inch
	More than 20 feet	plus or minus 3/4 inch
(b)	For any two successive intermediate points on the line or surface separated by:	
	10 to 20 feet, inclusive	1/4 inch
	More than 20 feet	3/8 inch
4.	Variation in cross-sectional dimensions from those specified and in thicknesses of slabs and walls from those specified.	Minus 1/4 inch Plus 1/2 inch
5.	Variation from specified elevation for top of concrete for Foundations, slabs, stairs, walkways and walls.	plus or minus 1/2 inch

F. Surface Irregularities:

1. Bulges, depressions, and offsets are defined as surface irregularities or roughness.
2. Surface irregularities are classified as "abrupt" or "gradual" and allowable tolerances are specified in Table 03 30 00D - Surface Tolerances.
   a. A surface tolerance is designated by a capital "T" followed by a number 1 through 5.
   b. Surface tolerance designations are separate from surface finishes and structural deviations.

3. Abrupt Surface Irregularities:

   a. Abrupt surface irregularities are defined as offsets such as those caused by misplaced or loose forms in which maximum dimension of irregularity perpendicular to surface is greater than maximum dimension of irregularity in plane of surface.

   b. Abrupt surface irregularities include all incidences of isolated surface irregularities which exceed specified gradual irregularities.

4. Gradual Surface Irregularities:

   a. Gradual surface irregularities are defined as bulges and depressions resulting in gradual changes on surface.

   b. Gradual surface irregularities are further defined as isolated undulations on surface. Maximum dimension of undulation perpendicular to surface is small relative to maximum dimension of undulation in plane of surface.

5. Check magnitude of surface irregularities of formwork and finished surfaces to ensure that surfaces are within specified tolerances.

G. Surface Tolerances:

Table 03 30 00D - Surface Tolerances

Concrete surface	Maximum allowable surface irregularity tolerance	
	Abrupt	Gradual
T1	1 inch	1/4 inch/inch
T2	1/2 inch	1/8 inch/inch
T3	1/4 inch	1/16 inch/inch
T4	1/8 inch	1/32 inch/inch

H. Repair of hardened concrete not within specified tolerances.

1. Repair hardened concrete which is not within specified tolerances to bring it within those tolerances.

2. Perform repair after consultation with a Government inspector regarding method of repair. Notify COR as to time when repair will be performed.

3. Repair concrete which will be exposed to view in a manner which will result in a concrete surface with uniform appearance.

   a. When grinding surfaces exposed to view, limit depth of grinding such that no aggregate particles are exposed more than 1/16 inch in cross section at finished surface.

b. Where grinding has caused or will cause exposure of aggregate particles greater than 1/16 inch in cross section at finished surface, repair concrete by excavating and replacing concrete.

I. Field Verification of Surface Tolerances:

1. Determine compliance of a surface with specified surface tolerances.

2. Evaluate surface roughness.

a. Measure roughness height or depth and check for compliance with values specified in Table 03 30 00D - Surface Tolerances and Table 03 30 00C - Deviations from Specified Lines, Grades, and Dimensions.

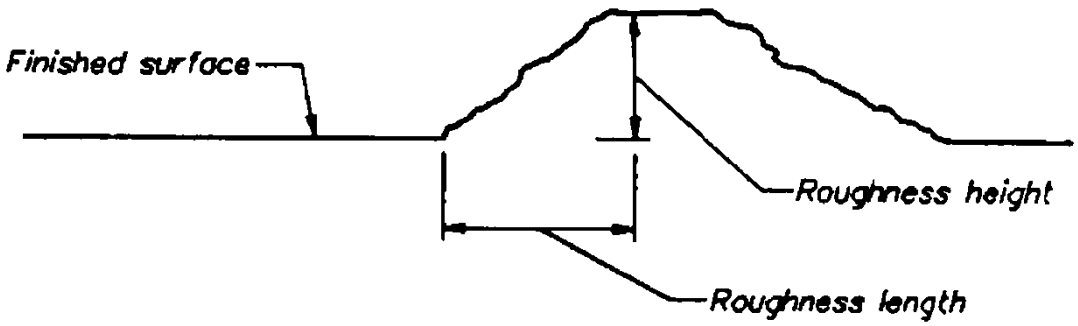
b. When measured height or depth of roughness is less than value in abrupt tolerance specification and height or depth of roughness does not cause structure to exceed any applicable value specified in Table 03 30 00C - Deviations from Specified Lines, Grades, and Dimensions, surface roughness is acceptable.

c. When roughness height or depth exceeds abrupt tolerance specification, determine roughness slope for comparison to gradual tolerance specification.

1) Measure roughness length and determine roughness slope by dividing roughness height or depth by roughness length (see Figure 1).

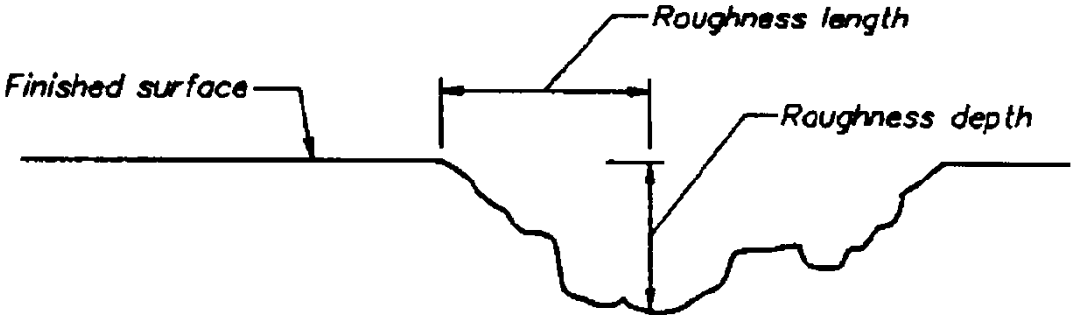
2) When roughness slope is greater than slope specified by gradual tolerance specification, surface roughness is unacceptable.

3) When roughness slope is less than gradual slope specified and gradual roughness does not cause structure to exceed allowable structural deviations, surface roughness is acceptable.



$$\text{Roughness slope ratio} = \frac{\text{Roughness height}}{\text{Roughness length}}$$

CASE 1 = Offset on the Surface



$$\text{Roughness slope ratio} = \frac{\text{Roughness depth}}{\text{Roughness length}}$$

CASE 2 = Offset into the Surface

FIGURE 1

J. Measuring Surface Roughness:

1. Examples below illustrate how to make necessary surface measurements for typical roughness.

2. Case 1 - Roughness Protruding above Surface:

   a. A roughness protruding above the surface should be measured with a straightedge that is at least 20 times longer than the roughness height being measured.

   b. Position the straightedge with one end resting on top of the roughness, as shown in Figure 2 (case 1).

   c. Determine the roughness height by measuring the maximum gap that occurs normal to the straight edge.

   d. Also, note the position on the straightedge from which the normal distance is measured.

   e. To determine the roughness length, measure the distance along the straightedge from the point where the height was measured to the point of contact between the straightedge and the top of the roughness.

   f. The roughness slope is defined as the ratio of the roughness height to the roughness length.

   g. As roughness is seldom symmetric, moving the position of the straightedge about the roughness may be necessary to locate the point where the maximum height and slope exists.

3. Case 2 - Roughness Extending below the Surface:

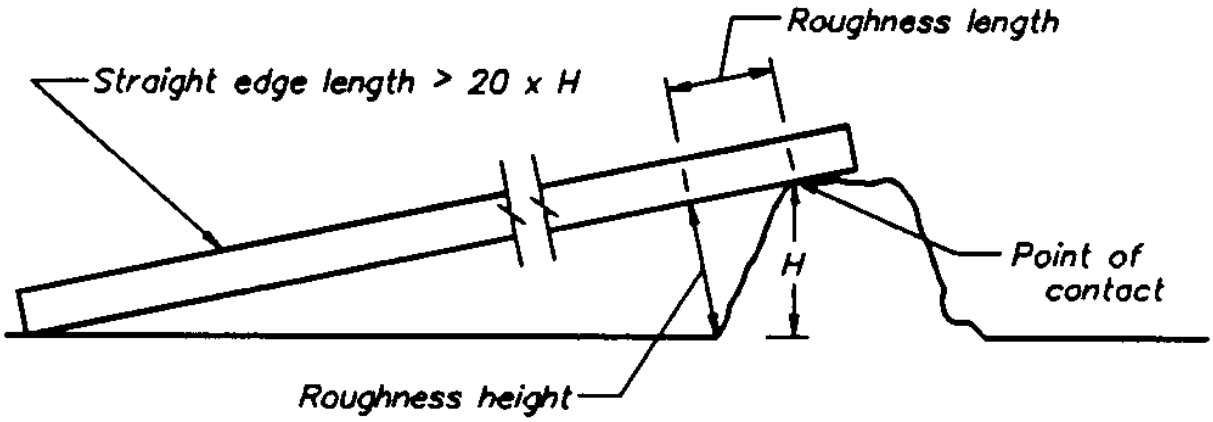
   a. A roughness occurring as an indentation to the surface is measured by placing the straightedge across the indentation, as shown in Figure 2 (case 2).

   b. Measure the maximum gap between the straightedge and the surface and note the location of the measurement on the straightedge.

   c. From the point of the depth measurement, measure along the straightedge in both directions to the point of contact with the surface.

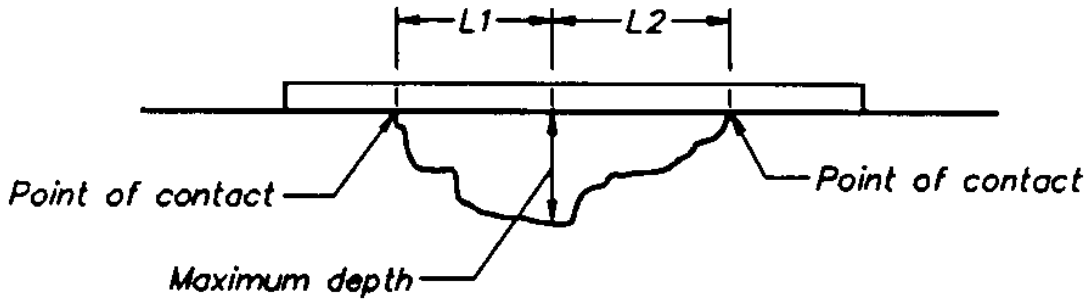
   d. The shortest length measured is used as the roughness length.

   e. Divide the roughness depth by the roughness length to determine the roughness slope.



CASE 1

$$\text{Roughness slope} = \frac{\text{Roughness depth}}{\text{The shortest distance L1 or L2}}$$



CASE 2

FIGURE 2

K. Prevention of Repeated Failure to Meet Tolerances:

1. When concrete placements result in hardened concrete which does not meet specified tolerances, submit to COR an outline of preventive actions such as modifications to forms, modified procedure for setting screeds, and different finishing techniques to be implemented to avoid repeated failures. Submit when requested by COR.

2. Government reserves the right to delay concrete placements until preventive actions which have been approved by COR are implemented.

3.06 CURING

A. Water Curing:

1. Keep concrete surface wet for 14 days, minimum, from time concrete has attained sufficient set to prevent detrimental effects to surface.

2. Cure Methods:

a. Water-saturated material.

b. System of perforated pipes, mechanical sprinklers, or porous hose.

c. Other methods which will keep surfaces wet.

d. Subject to approval by COR.

3. When water curing is anticipated for RSMC, include water curing methods for RSMC in RSMC Temperature Control Plan. Provisions may be necessary to prevent rapid cooling of concrete surfaces.

B. Curing with Curing Compound:

1. Apply to concrete surface to provide a water-retaining film. Reapply as necessary to maintain a continuous, water-retaining film on surface for 28 days.

2. Thoroughly mix compound and spray apply in one coat to provide a continuous, uniform film over surface.

3. Do not exceed coverage rate recommended by curing compound manufacturer. Decrease coverage rate on rough surfaces as necessary to obtain required continuous film.

4. Ensure ample coverage on edges, corners, and rough surfaces.

5. Use spray equipment recommended by curing compound manufacturer.

C. Sheet Material Curing:

1. Includes curing with polyethylene film.

2. Thoroughly moisten concrete surface by lightly spraying with water as soon as concrete has hardened sufficiently to prevent damage.

3. Completely cover concrete surface with sheet material to provide an airtight, water-retaining film over entire surface.
4. Lap edges of sheet material to seal adjacent sheets.
5. Place tightly against concrete surface at extreme edge of curing area.
6. Secure sheet material to withstand wind and prevent circulation of air inside sheet material.
7. Keep surface covered for 14 days, minimum.

3.07 CONTRACTOR FIELD QUALITY TESTING

A. Perform sampling, testing, and reporting as required in Table 03 30 00E - Field Testing.

1. Independent testing agency shall meet requirements specified in Section 01 46 20 - Testing Agency Services.
2. Personnel conducting plastic concrete field tests: Qualified as ACI Concrete Field Testing Technician, Grade 1; or equal.
3. Personnel conducting concrete specimen tests: Qualified as ACI Concrete Strength Testing Technician; or equal.

B. Perform tests at least as often as the frequencies specified in Table 03 30 00E - Field Testing.

C. Notify COR immediately of test results showing failure of materials to meet specifications. Notify COR within 2 hours of test results showing materials meet specifications. Submit reports of test results as specified.

3.08 FIELD QUALITY ASSURANCE

A. In addition to specified Contractor Quality Field Testing, the Government may also perform the tests listed in Table 03 30 00E - Field Testing.

3.09 FIELD TESTING

Table 03 30 00E - Field Testing

TESTS OF	TEST STANDARD	STANDARD TITLE	TESTING FREQUENCY
Fresh Concrete Properties - tests performed at site	ASTM C143	Slump of Hydraulic-Cement Concrete	1 set of tests per load for first 2 loads. When tested concrete meets specifications, 1 set of tests each day of placement for each mixture for the first 50 or less cubic yards, and 1 set of tests for each additional 100 cubic yards of concrete. Minimum of 1 set of tests per hour during placements. When concrete does not meet specifications, test each load until 2 consecutive loads meet specifications, then resume testing frequency specified above.
	ASTM C231	Air Content of Freshly Mixed Concrete by the Pressure Method	
	ASTM C1064	Temperature of Freshly Mixed Hydraulic-Cement Concrete	
	ASTM C138	Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete	

Table 03 30 00E - Field Testing

TESTS OF	TEST STANDARD	STANDARD TITLE	TESTING FREQUENCY
Compressive Strength	ASTM C31 ASTM C39	Making and Curing Concrete Test Specimens in the Field Compressive Strength of Cylindrical Concrete Specimens	1 set of samples (6 inches by 12 inches) for each day of placement for each mixture for the first 50 or less cubic yards, and 1 set of samples for each additional 100 cubic yards of concrete. A minimum of 7 samples for strength testing (9 samples for mix 5) shall be made each time strength samples are collected. 2 additional field cured test cylinders during placement in adverse (hot or cold) weather. Cure these samples on jobsite under the same conditions as the concrete the cylinders represent for a minimum of 7 days, then transfer to the testing laboratory until testing at strength design days. Test 2 cylinders each at 7 days age, and 2 cylinders at strength design age. Maintain the last cylinder for testing in the event that the strength design age test results fall below the required strength.
Concrete Cores	ASTM C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete	At discretion of the Government when cylinder strengths fail to meet minimum requirements. Obtain core specimens in accordance with ASTM C42 at locations determined by COR, at no additional cost to the Government. Repair the core holes in accordance with USBR M-47 as determined by COR

A. Acceptance Criteria:

1. Cylinder Compressive Strength:

a. In accordance with ASTM C94, except as follows:

1) 90 Percent of test cylinders exceed specified compressive strength at design age.

2) Average compressive strength of any six consecutive test cylinders exceeds specified compressive strength at design age.

3) No individual strength test falls below specified compressive strength by more than 500 pounds per square inch for concrete with a specified strength of 5,000 pounds per square inch or less. When the specified strength is greater than 5,000 pounds per square inch, no individual strength test (average of two cylinder tests) shall be less than 0.90 of specified strength (f'_c).

2. Drilled Concrete Cores:

a. Concrete in placement represented by core tests will be considered structurally adequate when average compressive strength of three cores is equal to at least 85 percent of the specified compressive strength and no single core has a compressive strength of less than 75 percent of the specified compressive strength.

3.10 PROTECTION

A. Protect concrete from damage until final acceptance by Government.

1. Do not load, remove forms or shoring, or backfill against concrete until concrete has gained sufficient strength to safely support its weight and imposed loads.

2. Protect fresh concrete against erosion from rain, hail, sleet, or snow; contamination from foreign materials; and damage from foot traffic until the concrete has hardened.

3. Protect concrete from heavy foot traffic and other construction activities by covering with plywood or other suitable material. Remove and dispose of temporary covering when no longer required.

B. Protect concrete when freezing temperatures are imminent.

1. Maintain concrete at a temperature of 50 degrees F (10 degrees C) or greater for 72 hours, minimum, after placement. Vent heater and prevent concrete from drying where artificial heat is employed.

2. Protect concrete from freezing during water curing. After discontinuance of water curing, maintain at a temperature of 50 degrees F (10 degrees C) or greater for next 72 hours.

3. Discontinue protection against cold weather such that the drop in temperature of the concrete will be gradual and will not exceed 5 degrees F per hour and 40 degrees F in 24 hours for thin sections and 5 degrees F per hour and 20 degrees F in 24 hours for massive sections greater than 36 inches.

3.11 REPAIR

A. Repair concrete in accordance with USBR M-47.

B. Use repair or replacement method determined by COR.

3.12 FINISH, SURFACE TOLERANCES, AND CURING SCHEDULES

Table 03 30 00F - Formed Surfaces

Surface	Finish	Maximum Allowable Tolerances	Acceptable Curing Methods
Surfaces upon or against which fill material will be placed	F1	T1	Water, White ASTM C309 Class A or B curing compound for horizontal surfaces, and White ASTM C309, Class B curing compound for vertical or sloped surfaces.
Surfaces not permanently concealed by fill material or concrete where appearance is not critical	F2	T3	Water, White ASTM C309 Class A or B curing compound for horizontal surfaces, and White ASTM C309, Class B curing compound for vertical or sloped surfaces.
Construction joints and surfaces to be covered by grout	F1	T2	Water White, ASTM C309 Class A curing compound
Expansion joints	F2	T3	Water White ASTM C309 Class A or B curing compound for horizontal surfaces, and White ASTM C309, Class B curing compound for vertical or sloped surfaces
Contraction joints	F2	T3	White ASTM C309 Class A curing compound

Table 03 30 00G - Unformed Surfaces

Surface	Finish	Maximum Allowable Tolerances	Acceptable Curing Methods
Surfaces to be covered by fill material or concrete	U1	T1	White ASTM C309 Class A or B curing compound for horizontal surfaces, and White ASTM C309, Class B curing compound for vertical or sloped surfaces
Tops of walls, Pedestals	U2	T3	White ASTM C309 Class A or B curing compound Polyethylene film or White Burlap-polyethylene sheet
Interior floor slabs	U3	T3	Per floor hardener manufacturer's recommendations
Exterior Walkways, stoops and slabs	U2 plus light broom finish	T2	White ASTM C309 Class A or B curing compound Polyethylene film or White Burlap-polyethylene sheet

END OF SECTION

SECTION 03 48 00
PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of precast concrete structures in price offered in the Price Schedule for Control Valve Vault and Flowmeter Vault.

   a. See Section 33 05 30 – Equipment Vaults, paragraph 2.01.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1.	ASTM C31/C31M-17	Standard Practice for Making and Curing Concrete Test Specimens in the Field
2.	ASTM C39/C39M-20	Test Method for Compressive Strength of Cylindrical Concrete Specimens
3.	ASTM C138/C138M-17a	Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
4.	ASTM C143/C143M-20	Test Method for Slump of Hydraulic-Cement Concrete
5.	ASTM C173/C173M-16	Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
6.	ASTM C192/C192M-19	Practice for Making and Curing Concrete Test Specimens in the Laboratory
7.	ASTM C231/C231M-17a	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
8.	ASTM C497-20	Test Methods for Concrete Pipe, Manhole Sections, or Tile
9.	ASTM C857-19	Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
10.	ASTM C858-19	Underground Precast Concrete Utility Structures
11.	ASTM C920-18	Elastomeric Joint Sealants

12.	ASTM C923-18	Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
13.	ASTM C990-09(2019)	Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
14.	ASTM C1064/C1064M-17	Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
15.	ASTM C1107/C1107M-20	Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
16.	ASTM C1478-19	Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes, and Laterals
17.	ASTM C1611/C1611-18	Test Method for Slump Flow of Self-Consolidating Concrete

B. Code of Federal Regulations (CFR)

1.	29 CFR 1910.27	Fixed Ladders

C. National Precast Concrete Association (NPCA)

1.	NPCA QC Manual 18th Edition	Quality Control Manual for Precast Concrete Plants

1.03 SUBMITTALS

A. Submit the following in accordance with 01 33 00 – Submittals.

B. RSN 03 48 00-1, Certificates, Product Data and Test Reports:

1. Submit quality control procedures established in accordance with NPCA Quality Control Manual for Precast Concrete Plants or verification of current NPCA Plant Certification.
2. Standard Precast Concrete Units:
   a. Standard precast concrete units, precast concrete producer shall supply cut sheets showing conformance to project drawings, requirements and to applicable industry design standards listed in this specification.
3. Proprietary Precast Concrete Units:
   a. Proprietary precast concrete units, precast concrete producer shall supply standard plans or informative literature. Contractor shall provide supporting calculations and design details. Precast concrete producer shall provide enough information as to demonstrate that vault will withstand loadings on drawings and vault dimensions.

4. Anchorage, Lifting Inserts and Devices:

   a. Anchors, lifting inserts and other devices, precast concrete producer shall provide product data sheets and proper installation instructions. Precast concrete unit dimensions and safe working load shall be clearly indicated.

5. Accessory Items:

   a. Items including, but not limited to sealants, gaskets, pipe entry connectors, steps, racks and other items installed before or after delivery, precast concrete producer shall include proper installation instructions and relevant product data.

6. Design Data:

   a. Precast concrete producer shall supply precast concrete unit design calculations and concrete mix design proportions and appropriate mix design test data. Structural design calculations shall be signed by a licensed professional engineer registered in the State of Washington.

7. Test Reports:

   a. Upon request, precast concrete producer shall supply copies of material certifications and/or laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolans, ground granulated blast-furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

   b. Upon request, precast concrete producer shall submit copies of test reports showing that mix has been successfully tested to produce concrete with properties specified and will be suitable for project conditions. Such tests may include compressive strength, flexural strength, plastic or hardened air content, freeze-thaw durability, abrasion and absorption. Special tests for precast concrete items shall be clearly detailed in the specifications.

   c. Upon request, precast concrete producer will supply copies of in-plant QA/QC inspection reports.

C. RSN 03 48 00-2, Approval Data:

1. Manufacturer's product data for precast reinforced concrete vault sections, precast lid, and joint sealant.

D. RSN 03 48 00-3, Dry-Fit Test

1. If precast Control Valve Vault will be shipped in multiple pieces, perform dry-fit test at plant prior to shipping.

   a. Verify pieces fit together within ASTM C858 tolerances.

2. If precast Flowmeter Vault will be shipped in multiple pieces, perform dry-fit test at plant prior to shipping.

   a. Verify pieces fit together within ASTM C858 tolerances.

1.04 QUALIFICATIONS

A. NPCA Plant Certification:

1. Precast concrete producer shall be certified by NPCA Plant Certification Program prior to and during production of products for this project.

   a. Inspection:

      1) Government may place an inspector in plant when units covered by this specification are being manufactured. Precast concrete producer shall give notice of 14-days prior to time precast concrete units will be available for plant inspection.

1.05 DELIVERY, STORAGE AND HANDLING

A. Delivery:

1. Precast concrete units shall be delivered to site prior to low-flow work period and in accordance with delivery schedule to avoid excessive build-up of units in storage at site. Upon delivery to jobsite all precast concrete units shall be inspected by Government's representative for quality and final acceptance.

B. Storage:

1. Precast concrete units shall be stored in a manner that will minimize potential damage.

C. Handling:

1. Precast concrete units shall be handled and transported in a manner to minimize damage. Lifting devices or holes shall be consistent with industry standards. Lifting shall be accomplished with methods or devices intended for this purpose as indicated on shop drawings. Upon request, precast concrete producer shall provide documentation on acceptable handling methods for product.

D. Final Acceptance:

1. Upon final acceptance, Government acknowledges and understands appropriate methods for handling accepted precast concrete unit(s). Upon acceptance by Government, precast concrete manufacture is not responsible for replacing damaged product resulting from improper handling practices on jobsite.

PART 2 PRODUCTS

2.01 DESIGN REQUIREMENTS:

A. Standard Precast Concrete Unit Design:

1. Contractor shall design standard precast concrete units (structure, covers and/or grating) to withstand A-0.3 ASTM C857. Design must also consider stresses induced during handling, shipping and installation in order to avoid product cracking or other handling damage. Design loads for precast concrete units shall be indicated on shop drawings
2. Provide block-outs and pipe entry connectors as required.

B. Non-Standard Precast Concrete Unit Design:

1. Design calculations and drawings of non-standard precast units shall be prepared and signed by a licensed professional engineer registered in the State of Washington and submitted for approval prior to fabrication. Calculations shall include the analysis of units for lifting stresses and sizing of lifting devices.
2. Provide block-outs and pipe entry connectors as required.

C. Joints and Sealants:

1. Joints and sealants between adjacent units shall be of type and configuration indicated on shop drawings meeting specified design and performance requirements.

D. Quality Assurance:

1. Precast concrete producer shall demonstrate adherence to standards set forth in NPCA Quality Control Manual for Precast Concrete Plants. Precast concrete producer shall meet requirements written in subparagraph 1.04.B.

2.02 MATERIALS

A. Concrete and Reinforcement:

1. Refer to ASTM C858.

B. Inserts and Embedded Metal:

1. Refer to Section 05 50 00 – Metal Fabrications.
2. Proprietary Items:
   a. In accordance with manufacturers published literature.

C. Joint Sealants and Joint Gaskets:

1. Preformed Flexible Joint Sealants for Steel Pipe:
   a. ASTM C990.
2. Elastomeric Joint Sealants:
   a. ASTM C920.

D. Pipe Entry Connectors:

1. ASTM C923.
2. ASTM C1478.

E. Grout:

1. Nonshrink Grout:
   a. ASTM C1107.
2. Cementitious Grout:
   a. Shall be of suitable mix design for intended use, consisting of portland cement, sand, and water.

2.03 PRECAST CONCRETE VAULT SECTIONS

A. Precast concrete vault conforming to ASTM C858:

1. No elliptical reinforcement allowed.
2. Control Valve Vault shall be watertight.
3. Flowmeter Vault shall be watertight.

B. Joint Sealant: Link-Seal System, Model No. LS-575 for 36” pipe or equivalent.

C. Ladder Rungs:

1. In accordance with 29 CFR 1910.27.
2. Cast iron, galvanized steel, stainless steel, or polypropylene coated steel.

D. Furnish precast concrete vault for mechanical equipment as shown on drawings. Minimum dimensions are shown on drawings.

E. Furnish grating, ladder, and other miscellaneous metalwork in accordance with Section 05 50 00 – Metal Fabrications.

F. Furnish floor access hatches in accordance with Section 08 31 20 – Floor Access Hatches

PART 3 EXECUTION

3.01 INSTALLATION

A. Site Access:

1. Contractor shall be responsible for providing adequate access to site to facilitate hauling, storage and proper handling of precast concrete units.

B. Installation:

1. Precast concrete units shall be installed to lines and grades shown in contract documents or otherwise specified.
2. Precast concrete units shall be lifted by suitable lifting devices at points provided by precast concrete producer.
3. Precast concrete units shall be installed in accordance with applicable industry standards. Upon request, precast concrete producer shall provide installation instructions.
4. Field modifications to product shall relieve precast producer of liability regardless if such modifications result in failure of precast concrete unit.

C. Watertightness:

1. Where watertightness is a necessary performance characteristic of precast concrete units end use, watertight joints, pipe-entry connectors and inserts should be used to ensure integrity of entire system.

END OF SECTION

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SECTION 03 62 20

NONSHRINK GROUT FOR EQUIPMENT AND METALWORK

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of nonshrink grout for equipment and metalwork in prices offered in the Price Schedule for items of work requiring Nonshrink Grout.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1. ASTM C1107/C1107M-20 Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 03 62 20-1, Packaged Nonshrink Grout Data:

1. Manufacturer's product data.
2. Manufacturer's certification that product meets specifications.
3. Manufacturer's instructions:
   a. Surface preparation, mixing, installation, finishing, curing, and protection recommendations.
      1) Include specific recommendations based on anticipated jobsite temperatures and environmental conditions.
      2) Include manufacturer's recommended methods for float finishing grout.
      3) Include manufacturer's recommended minimum temperature and protection period for protecting grout from freezing and damage after placement.

PART 2 PRODUCTS

2.01 PACKAGED NONSHRINK GROUT

A. Pre-mixed commercial hydraulic cement nonshrink grout mixture:

1. ASTM C1107.

B. Water:

1. Clean.
2. Free of detrimental quantities of silt, organic matters, salts, or other impurities.
3. As recommended by grout manufacturer.

C. Mix: In accordance with manufacturer's instructions to consistency recommended by manufacturer for application.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean and prepare base surface to which nonshrink grout will be bonded in accordance with manufacturer's instructions.

1. Roughen surface.
2. Remove dirt, laitance, loose, or defective concrete, curing compound, coatings, and other foreign material.
3. Wash with water.

B. Lubricate surface by washing with water immediately before placing nonshrink grout when delay occurs between washing and placing nonshrink grout.

3.02 PLACING

A. Place nonshrink grout in accordance with manufacturer's instructions to completely fill space to be grouted.

B. Place grouting to completely fill spaces adjacent to equipment and metalwork as shown on drawings.

C. Use forms, where required, to confine nonshrink grout.

3.03 CURING

A. Cure exposed surface of packaged nonshrink grout by method recommended by manufacturer.

B. Do not apply loads sooner than 72 hours after placement and only after nonshrink grout has attained compressive strength of at least 4,500 pounds per square inch, per manufacturer's information.

END OF SECTION

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SECTION 03 81 10
CONCRETE REMOVAL AND DISPOSAL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of concrete removal and disposal in price offered in the Price Schedule for Site Demolition.

1.02 REFERENCE STANDARDS

A. International Concrete Repair Institute (ICRI)

1. ICRI 310.2R-2013 — Guide for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

B. Bureau of Reclamation (USBR)

1. USBR M-47 — Standard Specifications for Repair and Maintenance of Concrete, August 2015 (Part 2 of "Guide to Concrete Repair"

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 03 81 10-1, Concrete Removal and Disposal Plan:

1. Submit concurrently with RSN 02 41 10-1, Selective Site Demolition, Demolition Plan.
2. Including but not limited to the following:
   a. Equipment to be used.
   b. Transportation methods for waste, scrap, or other debris.
   c. Disposal location of waste, scrap, or other debris.
   d. Describe methods, equipment, and sequence to be used for cutting and removing concrete.
   e. Describe temporary barriers and enclosures to be provided for protecting river contamination and containing dust during work.

1.04 PROJECT CONDITIONS

A. Concrete to be removed consists of cement, sand, and broken rock or gravel.

1. Structural concrete the be removed contains reinforcing steel.

B. Information drawings provide general locations of embedded reinforcement, pipe, conduit, and metalwork. Actual locations of these items may vary from what is shown on the drawings.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 GENERAL

A. Cease operations and notify COR if concrete removal operations:

1. Contact electrical conduit containing energized circuits.
2. Cracked concrete that is to remain in place.

B. Do not resume operations until instructed by COR.

C. Coordinate performance of noisy, malodorous, or dusty work with the COR and in accordance with Section 01 57 20 – Environmental Controls.

D. Control waste water in accordance with:

1. Approved plan.
2. Section 01 57 30 - Water Pollution Control.

3.02 EXAMINATION

A. Locate and mark exact locations of embedded reinforcement, pipe, conduit, and metalwork within concrete removal areas before beginning concrete removal.

B. Cease operations immediately if concrete removal operations come in contact with unexpected metalwork or reinforcing bars and notify COR. Do not resume operations until instructed to do so by COR.

C. Cease operations immediately if concrete removal operations cause cracking of remaining concrete structure and notify COR. Do not resume operations until instructed to do so by COR.

3.03 PREPARATION

A. Provide temporary barriers and enclosures.

B. Location of concrete removal on drawings is approximate. Verify and adjust concrete removal areas with COR in the field.

C. Prior to starting removal work, obtain written permission from COR.

3.04 REMOVAL

A. Initially remove damaged, deteriorated, loosened, or unbonded portions of existing concrete by jack hammering, or other approved method. Follow with approved mechanical means if necessary.

B. Produce rounded 1-inch radius corners.

C. Produce surfaces and edges suitable for required construction.

D. Use methods which will not damage concrete or reinforcement to remain in place.

E. Do not use jackhammers in excess of 30 pounds or, dry sandblasting, without COR approval.

1. Points on jackhammer bits shall cleanly break the concrete.
2. Replace or sharpen jackhammer bits without points.

F. Do not line drill perimeters of large openings.

G. Do not pry on concrete to be removed or existing reinforcement.

H. Blasting not permitted.

I. Do not use bush hammers or scabblers.

J. Drilling:

1. Drill cores at concrete removal corners as approved.
2. Drill holes through concrete where indicated on drawings.
3. Drill holes passing through concrete walls and floors with rotary diamond core bit.
4. Make cut edges clean and sharp.

K. Saw cutting:

1. Fully encompass removal area.
2. Produce clean, sharp edges.

3. Saw cut depth: Shown on drawings.
   a. Do not damage reinforcing steel.
   b. If embedment or other conditions prevent a minimum 1-inch saw cut depth, use a grinder to create a minimum 1/4-inch perpendicular face.
4. Limit number of corners.
5. Acute angels: Greater than approximately 70 degrees. Do not produce sharp corners.
6. Use diamond blade or diamond wire saws.
7. Make cuts normal to exposed concrete surface except as indicated on drawings.
8. Prevent kerfs from crossing.
9. Do not extend saw kerfs beyond specified limits of removal.
10. Chamfer permanently exposed cut 3/4-inch.

L. Reinforcement:

1. Replace reinforcing steel bar or section of bar that has lost more than 25 percent of its cross-sectional area.
   a. If adjacent bars are damaged, replace adjacent bars with 20 percent or more loss in cross sectional area.
   b. Replace bars to match original bar size to according to ACI 318, as appropriate or as approved by the COR.
2. Remove concrete shadows around circumferences of reinforcing bars.
3. When corroded reinforcement steel bars are exposed, remove additional concrete along corroded bars until a continuous length of 2-inch of bar free from corrosion is exposed.
   a. Assess limit of active corrosion on a visual basis.
   b. Edges of additional areas removed shall be cut square as specified below.
   c. Remove additional concrete along bar to accommodate couplers or lap splices for replacement reinforcement.
   d. Obtain approval from COR prior to additional concrete removal.
4. Where more than 1/3 of the diameter of a reinforcing bar is exposed by removal of concrete to required depth, excavate around exposed reinforcing bars.
5. When removing concrete in and around reinforcing steel to remain in place, use 15-pound or smaller chipping hammers, high or ultra-high pressure water jetting.
   a. For removal away from saw cut edges, cleanly break concrete with pointed jackhammer bits. Replace or sharpen jackhammer bits that are not pointed.

b. Complete removal near repair boundaries with hammers fitted with spade bits.

M. Cleaning and Surface Preparation:

1. Primary Cleaning - Remove dust and debris resulting from concrete removal.

   a. Use contained shotblasting, wet sandblasting, or water blasting to remove weakened or damaged concrete microfractured surfaces.

   b. If water blasting, use pressure sufficiently high to prepare surface. Pressures up to 15,000 psi may be necessary.

   c. Remove materials that weaken the bond between remaining concrete and new concrete.

   d. Include saw cut or ground faces.

   e. After primary cleaning, protect surface from contaminants.

2. Secondary Cleaning - Within 48 hours prior to placement of new concrete, use low pressure water jetting to remove materials that may impair bond.

3. Concrete substrate surface roughness: Equivalent to or larger than CSP 5 in accordance with ICRI 310.2R.

4. Clean and allow surfaces to dry thoroughly, unless specific repair technique requires application of materials to a saturated surface.

5. Do not use acids for cleaning or preparing concrete surfaces for repair.

3.05 REPAIR

A. Repair concrete and reinforcement outside of prescribed removal lines which is damaged or loosened during cutting and removal operations.

1. Repair or replace as determined by COR.

2. Repair or replace in accordance with Bureau of Reclamation (USBR) USBR M-47, Standard Specifications for Repair and Maintenance of Concrete, August 2015 and applicable sections of these specifications.

B. Concrete and reinforcement removed beyond prescribed limits or not approved by COR shall be repaired by Contractor at Contractor's expense.

3.06 DISPOSAL

A. Dispose of removed materials in accordance with Section 01 74 00 - Cleaning and Waste Management.

END OF SECTION

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DIVISION 04 – NOT USED

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DIVISION 05 – METALS

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of miscellaneous metalwork in the price offered in the Price Schedule for Control Valve Vault and Flowmeter Vault.
   a. Includes:
      1) Sump grating.
      2) Ladder and accessories.

1.02 DEFINITIONS

A. Miscellaneous Metalwork: Where either shown on the drawings or specified elsewhere in this section or these specifications, "miscellaneous metalwork" means metal fabrications as used in this section.

1.03 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC)

1.	AISC 325-17	Steel Construction Manual, 15th Edition
2.	AISC 360-16	Specification for Structural Steel Buildings

B. American Society of Mechanical Engineers (ASME)

1.	ASME B1.1-2019	Unified Inch Screw Threads (UN and UNR Thread Form)
2.	ASME B18.2.1-2012	Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)

C. ASTM International (ASTM)

1.	ASTM A36/A36M-19	Carbon Structural Steel
2.	ASTM A48/A48M-03(2016)	Gray Iron Castings
3.	ASTM A53/A53M-20	Pipe, Steel, Black and Hot-dipped, Zinc-Coated Welded and Seamless
4.	ASTM A108-18	Steel Bar, Carbon and Alloy, Cold-Finished

5.	ASTM A123/A123M-17	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
6.	ASTM A153/A153M-16a	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
7.	ASTM A385/A385M-20	Providing High-Quality Zinc Coatings (Hot-Dip)
8.	ASTM A449-14	Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
9.	ASTM A563-15	Carbon and Alloy Steel Nuts
10.	ASTM A780/A780M-20	Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
11.	ASTM F3125/F3125M-19e2	High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions
12.	ASTM F1554-18	Anchor Bolts, Steel, 36, 55, and 105 ksi Yield Strength
13.	ASTM F436/F436M-19	Hardened Steel Washers Inch and Metric Dimensions

D. American Welding Society, Inc. (AWS)

1.	AWS D1.1/D1.1M-20	Structural Welding Code – Steel

E. Commercial Item Description (CID)

1.	CID A-A-1923A	Shield Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)

F. National Association of Architectural Metal Mfrs. (NAAMM)

1.	NAAMM 531-17	Metal Bar Grating Manual

G.

H. International Code Council (ICC)

1.	ICC-ES AC308	Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete, October 2017 (Editorially revised April 2018)

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 05 50 00-1, Approval Drawings and Data:

1. Shop drawings showing location and layout of the metal fabrications and connections.
    a. Signed and sealed by a registered professional engineer.
2. Manufacturer's installation recommendations.
3. Manufacturer's product data.

C. RSN 05 50 00-2, Final Drawings:
1. Final drawings of shop and erection drawings.
    a. Show location, layout, and details of the metal fabrications and connections.
2. Signed and sealed by a registered professional engineer.

1.05 QUALIFICATION OF WELDERS

A. Qualify welders in accordance with AWS D1.1 using procedures, materials, and equipment of the type required for the work.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Protect from corrosion, deformation, and other types of damage.

B. Store items in an enclosed area free from contact with soil and weather.

C. Remove and replace damaged items with new items.

PART 2 PRODUCTS

2.01 MATERIALS

A. Structural Steel:
1. Angles: ASTM A36.

B. Bolts, Nuts, and Washers:
1. Bolts:
    a. ASTM F3125, Grade A325 Type 1, galvanized.
    b. Length of Bolt Threads: ASME B18.2.1.
    c. Thread Class: 2 free-fit, American National coarse-thread series.
2. Stud Bolts:
    a. Suitable for end welding to steel with automatically timed stud-welding equipment.

3. Nuts: ASTM A563, Grade DH, galvanized.
4. Washers:
   a. For ASTM F3125 bolts: ASTM F436, Type 1, galvanized.
5. Cap Screws:
   a. Galvanized steel, ASTM A449.

C. Grating: NAAMM 531:
1. Steel: Welded bar grating, galvanized.
2. Plain bar or serrated bar grating.

D. Grating Fasteners:
1. Steel stud bolts:
   a. Fully-threaded or partially-threaded stud bolts.
   b. Thread Class: 2 free-fit, American National coarse-thread series.
   c. Suitable for end welding to steel with automatically times stud-welding equipment.
2. Steel standard clips: As recommended by grating manufacturer.
3. Optional: In lieu of stud bolts and standard clips, 8-mm powder actuated threaded stud bolts, X-FCM fastening system manufactured by Hilti Incorporated, P.O. Box 21148, Tulsa OK 74121; or equal, may be used to fasten grating panels.

E. Steel Pipe: ASTM A53, type E or S, grade B, painted.
1. Unless otherwise shown on drawings, provide standard-weight, black, steel pipe.
2. Government inspection at the mill and hydrostatic tests will not be required.

F. Steel Pipe Sleeves: ASTM A53, standard weight, hot-dip galvanized

G. Arc-Welding Electrodes:
1. Use filler metal and shielding gases suitable for base materials, positions, and other conditions.
2. Filler metal and required shielding gases or fluxes: AWS D1.1.
3. Use filler metal with a minimum tensile strength of 70,000 pounds per square inch (psi) for steel.

2.02 ANCHORS

A. Adhesive Anchors: Drilled type, installed with a chemical adhesive system.
1. Seismic qualified per IBC and AC308 for seismic design category A through F and cracked concrete conditions.

2. Adhesive: HIT-HY 200 epoxy adhesive manufactured by HILTI, P.O. Box 21148, Tulsa, OK 74121; or equal, having the following essential characteristics:
   a. Injectable two-component epoxy adhesive.
   b. Dual packaging system designed for automatic mixing during injection.
   c. Weathering resistant.
   d. Resistant against high temperatures.
   e. Suitable for use in diamond cored or pneumatic drilled holes.
   f. Extended temperature range from 23 degrees F to 104 degrees F.
   g. Suitable for cold weather installation for in service temperature no less than 14 degrees F.
3. Threaded carbon steel anchor rod: HAS Anchor rod manufactured by HILTI, P.O. Box 21148, Tulsa, OK 74121; or equal, having the following essential characteristics:
   a. Rod material: ASTM F1554, Grade 36.
   b. Thread: ASME B1.1, continuously threaded (all-thread).
   c. Fabricate with 45-degree chisel point on one end to facilitate insertion into adhesive-filled hole.
   d. Hot-dip galvanized.
4. Standard Steel Nuts: ASTM A563, Grade A. Hot-dip galvanized.
5. Standard Steel Washers: ASTM F436, Type 1. Hot-dip galvanized.

B. Expansion Anchors:
   1. CID A-A-1923A, Type 4, galvanized steel.
   2. Bolt length:
      a. Provide bolt length with 3-1/2 inch minimum embedment.

C. Headed Concrete Anchors: ASTM A108.
   1. Flux-filled ends suitable for end welding to steel with automatically timed stud-welding equipment.

2.03 GROUT

A. Nonshrink Grout: In accordance with Section 03 62 20 – Nonshrink Grout for Equipment and Metalwork.

2.04 LADDER ACCESSORIES

A. Metal Safety Steps for Ladders:

1. "Tread-Grip" sheet steel ladder rungs as manufactured by Metalex, 700 Liberty Drive, Libertyville IL 60048; “Traction Tread™” ladder rung as manufactured by Eaton, 509 West Monroe Street, Highland IL 62249, or equal, having the following essential characteristics:
   a. Galvanized steel.
   b. Minimum rung width or diameter: 3/4”
   c. Concentrated load at center of rung: 200 pounds.
   d. Raised button or serrated-edge.

B. Safety Posts:
1. "Ladder-Up" ladder extensions as manufactured by The Bilco Co., PO Box 1203TR, New Haven CT 06505; or equal, having the following essential characteristics:
   a. Galvanized steel.
   b. Tubular section that provides upward and downward movement and locks automatically when fully extended in up position.
   c. Upward and downward movement controlled by stainless steel springs.
   d. Operates in corrosive environment.
2. Attach securely to ladder rungs.
3. Extend a minimum of 42-inches above walking surface.

2.05 FABRICATION

A. Fabricate metalwork in accordance with AISC 325, AISC 360, and these specifications.
1. Perform welding and related work in accordance with AWS D1.1.
2. Grind smooth all welds for ladder.

B. If straightening is necessary, use methods that will not injure the metal.

C. After shop work completion and before painting or galvanizing, clean material of rust, loose scale, dirt, oil, grease, slag from welded areas, and other foreign substances.

D. Galvanizing:
1. Galvanize items of metalwork as specified or shown on drawings. Use hot-dip galvanizing, where required after fabrication, in accordance with ASTM A123 and ASTM A385.
2. Galvanize bolts, screws, nuts, and washers in accordance with ASTM A153. Remove excess spelter by centrifugal spinning.
3. Galvanizing Repair:

a. Re-dip material with damaged galvanizing unless damage is local and can be repaired by zinc primer.

b. If the galvanized coating becomes damaged after being dipped twice, material will be rejected.

c. Repair procedure where local paint repair is authorized: Repair damaged galvanized surfaces in accordance with ASTM A780, except repair materials containing cadmium and lead are not permitted.

PART 3 EXECUTION

3.01 PREPARATION

A. Where locations and dimensions of miscellaneous metalwork shown on drawings are tentative or subject to change dependent upon equipment furnished, confirm locations and dimensions of miscellaneous metalwork prior to fabrication.

3.02 INSTALLATION

A. Anchors:

1. Drill holes for anchors straight and true and of diameter recommended by anchor manufacturer.
2. Install anchors in accordance with manufacturer's recommendations.
3. Follow manufacturer’s recommendations when embedded steel or reinforcement is encountered during drilling for anchors.
4. When drilling water is used, clean surfaces of concrete to remain exposed immediately to prevent discoloration.

B. Grout:

1. Where shown on drawings, fill spaces under metalwork completely as required with nonshrink grout in accordance with Section 03 62 20 – Nonshrink Grout for Equipment and Metalwork.
2. Clean surfaces of metalwork to be in contact with concrete or grout prior to installation.

C. Repair:

1. Installer’s Galvanizing Repair:

a. Re-dip material with damaged galvanizing unless damage is local and can be repaired by zinc primer.

b. If the galvanized coating becomes damaged after being dipped twice, material will be rejected.

c. Repair procedure where local paint repair is authorized: Repair damaged galvanized surfaces in accordance with ASTM A780, except repair materials containing cadmium and lead are not permitted.

END OF SECTION

DIVISIONS 06 AND 07 – NOT USED

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DIVISION 08 – OPENINGS

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SECTION 08 31 20
FLOOR ACCESS HATCHES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of floor access hatches in prices offered in the Price Schedule for Control Valve Vault and Flowmeter Vault.

1.02 SUBMITTALS

A. RSN 08 31 20-1, Product Data:

1. Product Data: Submit manufacturer's product data.

1.03 DELIVERY, STORAGE, AND PROTECTION

A. Protect floor access hatches from corrosion, deformation, and other types of damage.

B. Store items in an enclosed area free from contact with soil and weather.

C. Remove and replace damaged items with new items.

1.04 DESIGN REQUIREMENTS

A. Floor Access Hatches:

1. Aluminum floor access hatches of sizes shown on the drawings. Sizes shown on the drawings are minimum access opening dimensions.
2. Designed for a live load of 300 pounds per square foot.

PART 2 PRODUCTS

2.01 SINGLE LEAF FLOOR ACCESS HATCH

A. Aluminum access hatches of size shown on drawings and meeting the design load criteria in this section.

1. The size of hatch shown on drawings is the minimum access opening dimensions.

B. Ladder Access Hatch: Type J-AL, as manufactured by the Bilco Co., PO Box 1203, New Haven CT 06505, www.bilco.com; Model BFDDPA as manufactured by Babcock-Davis Hatchways, Incorporated, 50 Lowell Street, Arlington, MA 02174; or equal, having the following essential characteristics:

1. Frames suitable for embedment in concrete with top of cover flush with top of concrete vault.
2. Drainable channel frame or gutter-type frame with 1-1/2” drain coupling.
3. Operation of cover shall not be affected by temperature.
4. Diamond pattern plate covers designed to support of 300 pounds per square foot live load.
5. Heavy-forged stainless steel hinges with Type 316 stainless steel pins.
6. Compression spring operators enclosed in telescopic tubes or torsion springs to provide ease of operation when opening hatch.
7. Automatic hold-open device.
8. Type 316 stainless steel slam lock, released from top by removable key wrench and from underside by fixed handle.
9. Mill finish.

2.02 DOUBLE LEAF FLOOR ACCESS HATCH

A. Aluminum access hatches of size shown on drawings and meeting the design load criteria in this section.

1. The size of hatch shown on drawings is the minimum access opening dimensions.

B. Equipment Access Hatch: Type JD-AL, as manufactured by the Bilco Co., PO Box 1203, New Haven CT 06505, www.bilco.com; Model BFDDPA as manufactured by Babcock-Davis Hatchways, Incorporated, 50 Lowell Street, Arlington, MA 02174; or equal, having the following essential characteristics:

1. Frames suitable for embedment in concrete with top of cover flush with top of concrete vault.
2. Drainable channel frame or gutter-type frame with 1-1/2” drain coupling.
3. Operation of cover shall not be affected by temperature.
4. Diamond pattern plate covers designed to support of 300 pounds per square foot live load.
5. Heavy-forged stainless steel hinges with Type 316 stainless steel pins.
6. Compression spring operators enclosed in telescopic tubes or torsion springs to provide ease of operation when opening hatch.
7. Automatic hold-open device.
8. Type 316 stainless steel slam lock, released from top by removable key wrench and from underside by fixed handle.
9. Mill finish.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coat frame surfaces that come in contact with concrete or grout with a bituminous coating.

B. Install floor access hatches at locations shown on drawings and in accordance with manufacturer's instructions.

C. Install floor access hatches per manufacturers instructions to ensure proper drainage.

D. Embedded Metalwork:

1. Accurately locate hatch frame to be embedded in concrete. Hold frame in correct position and alignment and protect frame from damage and displacement during placing and setting of concrete.
2. Unless otherwise specified, use only metal braces, supports, and other items to position and align frame, which will be embedded in concrete. Do not use wooden braces, supports, or other items to position and align embedded metalwork if they will also be embedded in concrete.

3.02 REPAIR

A. Repair finishes damaged during installation.

END OF SECTION

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DIVISION 09 – FINISHES

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SECTION 09 96 20
COATINGS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of coatings in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1.	ASTM A 380-17	Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
2.	ASTM A 780-09(2015)	Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings
3.	ASTM C 920-18	Elastomeric Joint Sealants
4.	ASTM D 870-15	Testing Water Resistance of Coatings Using Water Immersion
5.	ASTM D 2794-93(2019)	Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
6.	ASTM D 4060-14	Abrasion Resistance of Organic Coatings by the Taber Abraser
7.	ASTM D 4285-83(2018)	Indicating Oil or Water in Compressed Air
8.	ASTM D 4541-17	Pull-Off Strength of Coatings Using Portable Adhesion Testers
9.	ASTM D 4587-11	Conducting Tests on Paint and Related Coatings and Materials Using a Fluorescent UV-Condensation Light- and Water-Exposure Apparatus
10.	ASTM D 5894-16	Cyclic Salt Fog/UV Exposure of painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)
11.	ASTM G 8-96(2019)	Cathodic Disbonding of Pipeline Coatings

B. International Organization for Standardization (ISO)

1.	ISO 8502-3-1992	Assessment of dust on Steel Surface Prepared for Painting (Pressure-Sensitive Tape Method)

C. National Association of Pipe Fabricators (NAPF)

1.	NAPF 500-03-04-17	Abrasive Blast Cleaning of Ductile Iron Pipe
2.	NAPF 500-03-05-17	Abrasive Blast Cleaning of Cast Ductile Iron Fittings

D. The Society for Protective Coatings (SSPC)/NACE International (NACE)

1.	SSPC-AB1-17	Mineral and Slag Abrasives
2.	SSPC-AB2-16	Cleanliness of Recycled Ferrous Metallic Abrasives
3.	SSPC-AB3-17	Newly Manufactured or Re-Manufactured Steel Abrasives
4.	SSPC-PA1-16	Shop, Field, and Maintenance Painting of Steel
5.	SSPC-PA2-17	Measurement of Dry Paint Thickness with Magnetic Gages
6.	SSPC-QP1-15	Evaluating Painting Contractors (Field Application to Complex Industrial Structures)
7.	SSPC-QP3-10/AISC 420	Evaluating the Qualification of Shop Painting Contractors
8.	SSPC-SP1-16	Solvent Cleaning
9.	SSPC-SP5/NACE 1-07	White Metal Blast Cleaning
10.	SSPC-SP10/NACE 2-07	Near-White Blast Cleaning
11.	SSPC-SP11-13	Power Tool Cleaning to Bare Metal
12.	SSPC-SP16-10	Bruch-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steel, and Non-Ferrous Metals
13.	SSPC-VIS1-12	Guide and Reference Photographs for Steel Surfaces Prepared by Abrasive Blast Cleaning
14.	SSPC-VIS3-07	Visual Standard for Power- and Hand-Tool Cleaned Steel
15.	NACE SP 0188-06	Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates

16.	NACE SP 0274-11	High Voltage Electrical Inspection of Pipeline Coatings
17.	NACE SP 0287-16	Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape
18.	NACE TM 0174-02	Laboratory Method for the Evaluation of Protective Coatings and Linings Materials on Metallic Substrates in Immersion Service

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 09 96 20-1, Approval Data:

1. For each coating material selected under Coating Tabulations 2:
   a. Current manufacturer's product data sheet, application sheet, and Safety Data Sheet (SDS).
   b. Identification of "Items to be coated" including sub-letter and sub-number listed in Coating Tabulations.
2. For each caulk and filler:
   a. Manufacturer's product data, application, and SDS sheets.
   b. Identification of areas of use including sub-letter and sub-number listed in Coating Tabulations.
3. For each substituted coating material "equal" to specified product in Coating Tabulation:
   a. List of not less than 5 similar successful material applications:
      1) Project name, location, type of structure, and application dates.
      2) Owner's name, address, and telephone number.
   b. Certification that material meets or exceeds specified requirements:
      1) Manufacturer's certification including technical representative's signature and date of signature.
      2) Independent laboratory's certified test reports.

C. RSN 09 96 20-2, Final Approval Data:

1. For each coating material and thinner:
   a. Purchase orders including order number, date, manufacturer's designated product name, batch number(s), and quantity purchased.
   b. Supplier's name, address, and phone number.

D. RSN 09 96 20-3, Paint Chip Samples:

1. Color chip samples approximately 4 by 6-inch.
2. Label each sample to include manufacturer's designated product name, color, and gloss.
3. Supply paint chip samples to the COR for selection and approval.

E. RSN 09 96 20-4, Qualifications:

1. Coating Contractor:
   a. Provide current AMPP-QP1 certification for field coating and AMPP-QP3 certification for shop coating to be requested as needed and at the discretion of the COR for Tabulations No. 2.
   b. List not less than 5 comparable completed jobs for each coating type including owner's name, address, and telephone numbers completed within the last five years.
2. Coating Applicators:
   a. List of not less than 5 comparable jobs for each coating type including owner's name, address, and telephone number.
   b. Provide one of the options below indicating personnel are qualified with relevant knowledge of surface preparation, coating materials, mixing, thinning and application practices:
      1) Statement from contractor.
      2) Statement from coating or equipment supplier
3. Coating Contractor Inspector:
   a. Provide one of the following to document qualifications to inspect specified coating materials:
      1) Current certification for NACE Certified Coatings Inspector (CIP) Level 3 or Association for Materials Protection and Performance (AMPP) Senior Certified Coatings Inspector.
      2) Letter from contractor listing the personnel performing inspections and current certifications for each.
         a) Inspector: certified at a minimum as NACE CIP Level 1 or AMPP Basic Coating Inspector.
         b) Supervisor: review and certify inspection results as a NACE CIP Level 3 of AMPP Senior Certified Coatings Inspectors.
4. Third-Party Inspectors:
   a. Current NACE Level 3 or AMPP Certified Coatings Inspector Certified Coatings Inspector.

b. List not less than 5 years of comparable jobs including project description, location, and owner's name, address, and telephone numbers.

c. Provide calibrated inspection equipment and demonstrate the use if required by the COR.

F. RSN 09 96 20-5, Quality Control Plan:

1. Quality Control Manager:

a. Name and title.

2. Quality Control Procedure:

a. Quality control plan.

1) Factory, shop, or field testing procedures shall be in accordance with these specifications, product manufacturer's written instructions, and NACE RP 0288, and ASTM D3276.

b. Procedure for addressing identified non-conformities.

G. RSN 09 96 20-6, Contractor Quality Testing Report:

1. Comprehensive report of daily quality control test reports.

1.04 DELIVERY, STORAGE, HANDLING

A. Deliver materials to jobsite in original, undamaged, unopened containers labeled with manufacturer's name, designated product name, batch number, date of manufacture, and any special instructions.

B. Deliver materials in containers not larger than 5 gallons as packaged by manufacturer unless suitable equipment is provided at jobsite to handle and thoroughly mix materials in larger containers.

C. Store coating materials and thinners in accordance with the manufacturer's recommendations, and as a minimum, store off the ground, under cover, and at 50 to 95 degrees F.

D. Do not use coating material which has exceeded manufacturer's specified storage stability period (shelf life).

1.05 AMBIENT CONDITIONS

A. Maintain environmental conditions to meet coating manufacturer's requirements during surface preparation, coating application, and curing period. Provide heating or cooling, and dehumidification as needed. Complete curing before placing the coating systems into service.

B. Coatings shall be applied when the substrate surface temperature is 5 degrees F or more above the dew point temperature and for at least 8 hours after application.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Surface preparation and spray application equipment:

1. Sized in accordance with coating manufacturer's recommendations.
2. Provide:
   a. Pressure gauges and pressure regulators.
   b. Air supply lines free from oil and moisture.

2.02 ABRASIVES

A. Mineral and slag abrasives: Meets SSPC-AB1, type I (natural minerals) and type II (slags), class A.

B. SSPC-AB2 for recycled cleanliness.

C. SSPC-AB3 Class I (steel) or II (iron) for angular shaped grit. Shot abrasives are not acceptable.

D. Commercially available products or processes to render the hazardous waste stream non-hazardous and not exceeding toxicity threshold limits.

1. Additive stabilizers for leachable toxic metal wastes are allowed, except elemental iron is not permitted.

2.03 COATINGS

A. Specified in Coating Tabulations:

1. Apply only one coating system per option in Coating Tabulations.
2. Apply compatible products of same manufacturer for coating system components.

B. Volatile Organic Compounds (VOC): Do not exceed maximum permitted by Federal, State, and local air pollution control regulations as supplied in container or by addition of thinner material.

C. Factory color or tint only. Do not color or tint at jobsite.

D. Use manufacturer's recommended thinners for coating materials.

E. Do not use accelerator products unless approved by COR.

2.04 FILLERS AND CAULKS

A. Caulks:

1. Coating manufacturer's standard or compatible caulk material.
2. Polyurethane, silicone, or silicone acrylic caulk material: Meets or exceeds ASTM C 920 type S or M, grade NS, class 25, suitable for water immersion service.

B. Fillers:

1. Carboguard 501, as manufactured by Carboline, www.carboline.com.
2. Devmat 142HB, as manufactured by International Paint, www.international-pc.com.
3. PPG Amercoat 114 A, as manufactured by PPG, www.ppgpmc.com.
4. Steel Seam FT910, as manufactured by Sherwin Williams, www.sherwin-williams.com.
5. Surfacing Epoxy Series 215, was manufactured by Tnemec, www.tnemec.com.
6. Provide one of the above fillers, or equal with following essential characteristics:
   a. Coating manufacturer's standard filler material.
   b. Approved use by manufacturer.

PART 3 EXECUTION

3.01 PROTECTION OF ADJACENT SURFACES

A. Remove, mask, or otherwise protect items or surfaces not coated from contamination and damage during cleaning and coating operations.

B. Examples include protecting mating and machined surfaces, mechanical and electrical equipment (open or enclosed), instruction and similar plates, and wet and newly coated surfaces.

3.02 COATING OF METALWORK EMBEDDED IN CONCRETE

A. For atmospheric exposure on both sides of embedded concrete or when mechanical bond is needed:

1. Penetrations through concrete: Extend prime coat on steel six inches minimum into concrete embedment measured from face of concrete and along surface of embedded.
2. Examples include: Above ground thrust or anchor blocks, floors, and walls with pipe or metal passing through the concrete.

B. For burial or immersion service exposure on either side of concrete faces:

1. Extend primer coat on steel continuously through solid concrete structure.

2. Examples include: Buried pipe which will be embedded in concrete through anchor blocks, walls, and related concrete structures.

C. For atmospheric service exposure with one side in contact with grout or concrete:

1. Coat exposed side completely and no coating required with grout or concrete contact.

2. Examples include pump anchor plates and pump pedestals, also embedded sill plates, anchor plates.

D. Caulk the concrete/steel interface to seal gaps at exposed faces in accordance with manufacturer's instructions with maximum thickness of 1/2-inch.

3.03 SURFACE PREPARATION

A. Remove or repair surface irregularities and impart profile as specified:

1. Welds:

a. Welds: Smooth and continuous.

b. Weld spatter, slag, buckshot, laminations, and slivers: remove and grind smooth.

c. Undercuts and porosity: Fill with weld material and grind smooth.

d. Projections, sharp edges, high points, fillets, and corners: Grind smooth to a radius of at least 1/16-inch.

2. Substrate defects:

a. Pitting, gouges, scratches, and similar:

1) Grind smooth.

2) Defects exceeding 20 percent reduction in wall thickness require weld repairs.

3. Grind full length of edges and corners smooth to a radius of at least 1/16-inch.

B. Surface preparation method:

1. See Coating Tabulations.

a. SSPC-SP1: Solvent Cleaning

b. SSPC-SP5: White Metal Blast Cleaning:

c. SSPC-SP11 where abrasive blasting is impractical.

1) For surrounding intact coating (nominal 2 to 4-inch margin):

a) SSPC-SP1.

b) Feather abrupt edges and around repair area by hand or power tool with non-woven pad into adjacent tightly bonded coatings.

c) Roughen or abrade surface in accordance with manufacturer's recommendations to achieve matted or lusterless finish.

d. Cast Iron: NAPF 500-03-17, Blast Clean No. 4.

e. Ductile Iron Pipe: NAPF 500-03-17.

2. Compare prepared steel surfaces to following visual reference photographs for allowable visible contaminants and stains:

a. SSPC-VIS1 for abrasive blast cleaning.

b. SSPC-VIS3 for power and hand tool cleaning.

3. Assessment of dust contaminants:

a. Perform clear tape test method in accordance with ISO 8502-3.

b. Perform three tests per shift.

c. Acceptance Criteria: Degree of cleanliness shall meet Class 2.

C. Surface profile:

1. Prepare as specified in Coating Tabulations.

2. Where not specified, prepare in accordance with manufacturer's instructions for metallic substrates or existing coating surfaces and service environment.

3. Where manufacturer's instructions do not specify a surface profile, prepare blasted surfaces to following profile:

a. Atmospheric Service Environments: 1 mil or greater angular profile and less than specified millage of first applied coat.

b. Burial and Immersion Service Environments: Angular profile 2 mil or greater and less than specified millage of first applied coat.

4. Inspect surface profile in accordance with NACE SP 0287:

a. Use replica tape suitable for surface profile depth range.

b. Perform at least two tests per 1,000 square feet.

D. Re-clean or perform additional surface preparation of contaminated surfaces before coating application.

E. Heat cast iron components to between 140 and 180-degrees Fahrenheit to evaporate moisture for 2 hours minimum.

3.04 COMPRESSED AIR EQUIPMENT

A. Keep air compressor and spray application equipment lines free of oil and moisture during work.

B. Compressed air quality:

1. Perform tests in accordance with ASTM D4285.
2. Perform test at the beginning of every shift.

3.05 FILLERS AND CAULK APPLICATION

A. Caulk areas including crevices, gaps, plate seams, skip welds, and conduit penetrations.

B. Fill areas including prepared pits, cavitation, plate seams, and gaps at bolts and rivets.

C. Apply in a uniform texture, neatness, and color matched appearance.

D. Apply in accordance with manufacturer's instructions and achieve tight bond to substrate or previous coats.

3.06 COATING APPLICATION

A. Stripe coat:

1. Brush apply stripe coat to each coat applied.
2. Apply stripe coat prior to spray application of the primer, when practical.
3. Apply to edges, corners, interior angles, pits, plate seams, crevices, rivets, nuts, threads, bolts, washers, welds, and similar features.

B. Apply number of coats and coating thickness specified in Coating Tabulations.

1. Alternate coat colors to differentiate between coats.
2. Apply in accordance with manufacturer's instructions.
3. Apply in accordance with SSPC PA1.

C. Prevent overspray or dry spray. When such conditions occur, clean surfaces prior to application of subsequent coats.

D. Re-clean contaminated surfaces between coats.

E. Dry Film Thickness (DFT):

1. After each coat, inspect hardened coating system for DFT compliance in accordance with SSPC PA2.
2. Acceptance Criteria: no single spot measurement less than 80 percent minimum or in excess of 120 percent maximum specified.

F. Discontinuity (Holiday) Testing:

1. Inspect in accordance with NACE SP 0188:

   a. Use maximum test voltage for DFT as recommended by coating manufacturer to prevent coating damage.

2. Inspect pipeline coatings in accordance with NACE SP 0274:

   a. Use maximum test voltage for any DFT as recommended by coating manufacturer to prevent coating damage.

G. Coating Adhesion:

1. Test in accordance with ASTM D4541 at the direction of the COR.

3.07 CONTRACTOR FIELD QUALITY TESTING

A. Inspection Equipment:

1. Calibrate inspection devices and equipment in accordance with the manufacturer's instructions.

2. Verify calibration prior to every use.

B. Qualified personnel shall conduct tests and sign reports.

1. Perform tests in presence of the COR:

2. Provide rigging for COR to observe inspections.

C. Make daily reports for review by the COR, including:

1. Date of work.

2. Description of areas and work performed.

3. Environmental conditions.

4. Results from the following quality control tests:

   a. Surface profile.

   b. Visual comparison of prepared surfaces.

   c. Assessment of dust contaminants.

   d. Compressed air quality.

   e. Dry film thickness (DFT).

   f. Discontinuity (Holiday) testing.

   g. Coating adhesion testing (when directed by the COR).

D. Final inspection will take place after repairs, but before placing into service.

3.08 REPAIR AND REMEDIAL WORK

A. Repair defective or damaged areas of coatings in accordance with coating manufacturer's recommendations.

3.09 COATING TABULATIONS

Tabulation No. 01
Items to be coated – Commercial or manufacturer's product with a standard applied coating system: a. Electrical equipment. b. Prefabricated metal building
Factory or Shop applied permanent coating system: 1. Commercial or manufacturer's standard surface preparation and permanent coating system. 2. Items subject to sunlight shall be top-coated with ultraviolet (UV) stable materials. 3. Permanent coating system shall have minimum 10-year corrosion-free protection without significant defects in atmospheric exposure. 4. Color and gloss: Standard color unless a specific color is otherwise specified in the color schedule. 5. Unless otherwise specified, unexposed surfaces that require coatings, such as interior of cabinets, enclosures, and equipment, shall be given the manufacturer's standard permanent coated finish.
Field Repair: Repair damaged areas of coated surfaces with compatible materials to equal thickness and color match of undamaged areas, unless otherwise tabulated herein.

Tab AE-05.DOCX

Tabulation No. 02

Items to be coated – Interior and exterior:

a. 36” V-port knife-gate valve
b. Ferrous surfaces of air valve assembly.
c. Interior and exterior surface of ferrous pipe.
d. Ferrous fittings and valves for HDPE Pressure Pipe.

Notes:
1. Do not coat stainless steel, bronze, or non-metallic surfaces.
2. Do not coat mating surfaces, machine surfaces, seals, and surfaces that would be functionally impaired by the coating.
3. Coat all fasteners to include nuts, bolts, washers, and exposed anchors.

LINING OPTIONS

OPTION 1 – Fusion Bonded Epoxy in accordance with either AWWA C213 interior and exterior of steel pipe and/or fittings or AWWA C116 interior and exterior of ductile iron or grey-iron pipe and/or fittings.

OPTION 2 - 100% Solids Epoxy	Number and thickness of coats	Surface preparation method
Carboline: Plasite 4500 S Duromar: HPL-2510 International Paint: Enviroline 230 Raven Linings: AquataPoxy A6 Sherwin Williams: Sherplate PW Epoxy or Dura-plate UHS Tnemec: Series 22 Epoxoline or Series Epoxoline FC Color and gloss: manufacturer’s standard color and gloss	1 or more base coats apply at 20 to 40 mils DFT per coat, plus stripe coats. Total base coat system: 20-mil DFT, minimum 40-mil DFT, maximum	SSPC-SP1 followed by - For steel: SSPC-SP10/NACE 2 For ductile iron: NAPF 500-03-04 For cast-iron: NAPF 500-03-05 2.5-4.0 mil profile Follow manufacturer’s surface preparation and application instructions to apply subsequent coats.

Tabulation No. 02		
OPTION 3 - Epoxy	Number and thickness of coats	Surface preparation method
Carboline: Carboguard 891 PPG: Amerlock 2 or 400 or Amercoat 235 Sherwin Williams: Duraplate 235 Tnemec: Epoxoline Series N69 or V69 Color and gloss: see color schedule	3 or more base coats, apply at 4 to 8 mils DFT per coat, plus stripe coats. Total base coat system excluding stripe coats: 12-mil DFT, minimum 24-mil DFT, maximum	SSPC-SP1 followed by - For steel: SSPC-SP10/NACE 2 For ductile iron: NAPF 500-03-04 For cast-iron: NAPF 500-03-05 2.5-4.0 mil profile Follow manufacturer's surface preparation and application instructions to apply subsequent coats.
OPTION 4 – 100% Solids Epoxy	Number and thickness of coats	Surface preparation method
Carboline Plasite 4500 Tnemec: Series 431 Duromar: HPL-2510 PPG Amercoat 113 International Paint: Enviroline 376F-30LT NSP Products: NSP 120 Sherwin Williams: Dura-Plate UHS	Follow coating manufacturer's instructions for number of coats and thickness per coat. Total coating system excluding stripe coats: 20-mil DFT, minimum 40-mil DFT, maximum	SSPC-SP1 followed by - For steel: SSPC-SP10/NACE 2 For ductile iron: NAPF 500-03-04 For cast-iron: NAPF 500-03-05 2.5-4.0 mil profile Follow manufacturer's surface preparation and application instructions to apply subsequent coats.

Tabulation No. 02	
PERFORMANCE REQUIREMENTS:	
Testing Protocol	Acceptance Criteria
Fresh/deionized water immersion test, ASTM D 870:	passes 2 years test with aerated water at ambient temperature with no blisters on either scribed or unscribed sides.
Dilute Harrison immersion test, Modified ASTM D 870:	passes 2 years test with aerated water at ambient temperature with no blisters on either scribed or unscribed sides.
Epoxy, ASTM D 4060, CS-17 wheel, 1,000 cycles, 1-kg load:	100% Epoxy: 60 milligram or less
Direct impact, ASTM D 2794:	80 inch-pounds
Pulloff adhesion, ASTM D 4541, annex A2, type II tester:	1500 psi or greater
Cyclic testing salt fog/UV, ASTM D 5894:	1/4 inch or less undercutting at 3000 hrs.
Cathodic disbondment, ASTM G 8:	1/4 inch or less disbondment 120-day test

Tabulation No. 03	
Cement mortar lining repair: a. Repair damaged areas to cement mortar lining	
Notes: 1. Fill inside joint recess of cement mortar lined pipe with cement mortar per AWWA C205.	
Coating materials Cement-mortar coating	Surface preparation method
For ferrous surfaces: Repair in accordance with AWWA C602, by in-place method. For girth welds and damaged areas: Apply in accordance with AWWA C602, in-place method.	Remove all sediment and organic accumulation on and around damaged area For repairs: In accordance with AWWA C602

Tabulation No. 04
Items of galvanized surface to be repaired: a. Vault floor hatch b. Ladders c. Floor grating d. Damaged galvanized surfaces not otherwise tabulated.
Repair damaged galvanized surfaces in accordance with ASTM A780, except repair materials containing cadmium and lead are not permitted.

Tab AE-11.DOCX

Tabulation No. 05
Items not to be coated and to receive a uniform passivation layer – Damaged Stainless steel: a. Stainless steel-clad surfaces not otherwise tabulated herein
Note: a. Do not coat stainless steel items listed above. Stainless steel surfaces to receive uniform passivation. 1. Do not damage attached parts, adjacent parts, or materials by field cleaning and passivation methods of stainless steel.
Clean, restore, and inspect uniform passivation layer on damaged, contaminated, or depassivated stainless steel surfaces in accordance with ASTM A380.

Tab AE-14.DOCX

3.10 COLOR SCHEDULE

A. Colors and glosses of finished coats to meet one or more of the following:

1. To be selected and approved by the COR.
2. Manufacturer's standard color.
3. Match existing color and gloss.

END OF SECTION

DIVISIONS 10 THROUGH 12 – NOT USED

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DIVISION 13 – SPECIAL CONSTRUCTION

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SECTION 13 34 19
PREFABRICATED METAL BUILDING SYSTEM

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of metal building system in price offered in the Price Schedule for Control Valve Vault and Flowmeter Vault.

1.02 SUMMARY

A. Section includes design, fabrication, delivery, and installation of a prefabricated, pre-engineered metal utility building to match the dimensions of and be installed on precast concrete vaults for Valve Control and Flowmeter with a removable roof system to allow overhead access to below-grade assemblies through hatches in the concrete vaults.

B. The work includes:

1. Structural steel framing and wall/roof panels.
2. Lift-off or bolt-off removable roof with weather-tight gasketed seals.
3. Personnel access door(s), base trim, flashing, and anchorage hardware.
4. Optional electrical, lighting, and ventilation components.
5. Factory finish coatings.

1.03 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC)

1.	AISC 360-05	Specification for Structural Steel Buildings

B. ASTM International (ASTM)

1.	ASTM A36/A36M-08	Carbon Structural Steel
2.	ASTM A307-07b	Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
3.	ASTM A325-09	Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
4.	ASTM A490-08b	Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength

5.	ASTM A500/A500M-07	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
6.	ASTM A501-07	Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
7.	ASTM A529/A529M-05	High-Strength Carbon-Manganese Steel of Structural Quality
8.	ASTM A572/A572M-07	High-Strength Low-Alloy Columbium-Vanadium Structural Steel
9.	ASTM A653/A653M-08	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
10.	ASTM A792/A792M-08	Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
11.	ASTM C1363-05	Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

C. American Welding Society (AWS)

1.	AWS D1.1/D1.1M-08	Structural Welding Code - Steel

D. International Code Council (ICC)

1.	IBC 2021	International Building Code

E. Underwriters Laboratories Inc. (UL)

1.	UL 580-06	Tests for Uplift Resistance of Roof Assemblies

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 13 34 19-1, Approval Drawings and Data:

1. Project-specific shop drawings.
   a. Layouts, structural member sizes, anchor locations, lifting points, roof fastener and gasket details, and removeable roof attachment method.
   b. Include an anchor bolt plan which shows size, location, and projection of anchor bolts.
   c. Manufacturer's standard or typical drawings may be included to show details. Mark standard or typical drawings to indicate relevant details.
   d. Sign and seal by registered professional engineer.

2. Manufacturer's product data. Include complete descriptions of and specifications for building system and materials including wall and roof panels, coatings, fasteners, door assemblies and hardware.
3. Manufacturer's standard color charts for color selection.
4. Warranty documents.

1.05 QUALIFICATIONS

A. Manufacturer Qualifications:

1. Minimum 10 years of experience producing pre-engineered enclosures for federal, utility, or transportation agencies.
2. Fabrication facility shall be ISO 9001-certified and located within the United States.

B. Installer qualifications: Minimum 5 years experience erecting pre-engineered enclosures of similar type and size.

C. Design Criteria:

1. Structural design shall conform to ASCE 7 for local wind and snow loads, seismic requirements per ASCE 7 and the IBC.
2. Roof panels or structure shall be removable without compromising weather-tightness upon reinstallation.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver components to site fully protected from weather and damage.

B. Store above ground, supported on blocking, with ventilation to prevent condensation.

1.07 WARRANTY

A. Structural Frame: Minimum 2-year warranty against defects in materials or workmanship.

B. Factory Finish: 20-year limited warranty against chalking, fading, or peeling.

C. Roof Seal System: 5-year warranty against water intrusion when properly reinstalled.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Dimensions:

1. Outside to outside dimensions of the building to match outside to outside dimensions of the vaults.
2. Minimum 8’ ceiling.

B. Structural Frame:

1. Cold-formed or welded galvanized steel, minimum 14 ga. Thickness.
2. Galvanizing per ASTM A123/A653, G90 minimum.
3. Factory-welded or bolted frame, designed for roof removal without field torching or cutting.

C. Wall Panels:

1. Galvanized or galvalume steel, 10-20 ga., with interlocking or over-lapping seam.
2. Factory-applied polyester or PVDF finish, color selected by COR from manufacturer’s standard options.

D. Roof Panels:

1. Same material and finish as wall panels.
2. Secured by captive fasteners, hinge-latch, or bolted perimeter system.
3. Gasketed compression seal providing weather-tight joint when installed.
4. Roof to be removable in maximum 30 minutes by two personnel using hand tools [or crane lift as indicated].

E. Doors and Hardware:

1. Personnel Door: 3’-0” x 7’-0”, powder-coated, hollow-metal door and frame with heavy-duty hinges, weather stripping, and ADA-compliant lever hardware.
2. Provide hasp for padlock or cylinder lock as determined by COR.

2.02 ACCESSORIES

A. Foundation Anchor Kit: Stainless steel or hot-dipped galvanized anchor bolts with base flashing.

B. Lifting Lugs: Welded structural loops designed for vertical lift of roof (or full enclosure).

C. Ventilation: Passive louvered vents.

2.03 FABRICATION

A. Fabricate building in controlled factory conditions with pre-punched holes and sealed joints.

B. Integrate roof gasket and compression hardware at perimeter frame.

C. Provide nameplate with manufacturer, serial number, and BABA compliance marking.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete is level within 1/8” in 10 feet.

B. Notify COR of discrepancies prior to installation.

3.02 INSTALLATION

A. Erect building in accordance with manufacturer’s instructions and approved shop drawings.

B. Anchor building securely to foundation with supplied fasteners.

C. Demonstrate to COR proper roof removal and reinstallation procedure.

D. Verify roof weather seal compression.

3.03 FIELD QUALITY CONTROL

A. Field inspection to verify fastener tightness, panel alignment, and roof sealing integrity.

B. Water test roof joints as directed.

C. Submit installation report to COR.

3.04 CLEANING AND PROTECTION

A. Clean exposed surfaces and touch-up any damaged coatings.

B. Protect building from damage until final acceptance.

END OF SECTION

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DIVISIONS 14 THROUGH 23 – NOT USED

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DIVISION 25 - INTEGRATED AUTOMATION

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SECTION 25 12 10
PROGRAMMABLE LOGIC CONTROLLER

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of programmable logic controllers and associated equipment and testing in lump sum price offered in the Price Schedule for Complete Electrical System.

1.02 DEFINITIONS AND ACRONYMS

A. A: Amps

B. AI: Analog Input

C. AO: Analog Output

D. DI: Digital Input

E. DO: Digital Output

F. FAT: Factory Acceptance Testing

G. GB: Giga Byte

H. HMI: Human Machine Interface

I. I/O: Input/Output

J. IP: Internet Protocol

K. LA Power: Local Actuator Power

L. mA: Milliamps

M. MOD Power: Modular Power

N. ms: Milliseconds

O. MB: Mega Byte

P. PLC: Programmable Logic Controller

Q. SA Power: Sensor/Actuator Power

R. SAT: Site Acceptance Testing

S. SCADA: Supervisory Control and Data Acquisition

T. SPD: Surge Protection Device

U. VAC: Voltage Alternating Current

V. VDC: Voltage Direct Current

W. W: Watts

X. Automation Control: Application of technology to monitor and control processes.

Y. Communications: A network of communication equipment and associated protocols

Z. Control system diagram: conceptual diagram of the functional interrelationship of subsystems, usually in block form.

AA. CPU: Central Processing Unit.

BB. Dielectric test: tests made to determine ability of insulating materials and spacings to withstand specified overvoltages for a specified time without flashover or puncture.

CC. DRAM: Dynamic Random-Access Memory.

DD. Drift: as applied to devices such as pressure switches, temperature switches etc., a change in operating characteristics over a specified number of operations or time and specified environmental conditions.

1.03 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)

1.	ASME B30.2-2022	Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)

B. Code of Federal Regulations (CFR)

1.	29 CFR 1910 - 2022	Occupational Safety and Health Standards
2.	47 CFR Part 15 – 2023	Radio Frequency Devices

C. Facilities Instructions, Standards and Techniques (FIST)

1.	FIST 4-1B – 2024	Maintenance Scheduling for Electrical Equipment

D. Institute of Electrical and Electronics Engineers (IEEE)

1.	IEEE 1613 – 2009	Standard for Environmental and Testing Requirements for Communications Networking Devices in Electric Power Substations.
2.	IEEE 3003.2-2014	IEEE Recommended Practice for Equipment Grounding and Bonding in Industrial and Commercial Power Systems
3.	IEEE C37.90.1	Standard for Surge Withstand Capability (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus
4.	IEEE C37.90.2	Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers
5.	IEEE C62.41.1-2008	Guide on the Surge Environment in Low-Voltage (1000V and Less) AC Power Circuits

E. International Electrotechnical Commission (IEC)

1.	IEC 60068-2-1:2007	Environmental testing – Part 2-1: Tests – Test A: Cold
2.	IEC 60068-2-2:2007	Environmental testing – Part 2-2: Tests – Test B: Dry Heat
3.	IEC 60068-2-14:2007	Environmental testing – Part 2-14: Tests – Test N: Change of Temperature
4.	IEC 60068-2-30:2007	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)
5.	IEC 60870-3-(1989)	Telecontrol equipment and systems Part 3: Interfaces (Electrical Characteristics)
6.	IEC 61131-1-(2003)	Programmable Controllers – Part 1: General Information
7.	IEC 61131-3:2013	Programmable controllers – Part 3: Programming Languages
8.	IEC 61131-2-(2007)	Programmable Controllers – Part 2: Equipment Requirements and Tests
9.	IEC 61508-3-(2010)	Functional Safety of Electrical/Electronic/Programmable Safety-Related Systems – Part 3: Software Requirements

10. IEC 62443-2020 — Industrial Communication Networks – Network and System Security

F. International Society of Automation (ISA)

1. ISA 101.01 — Human Machine Interfaces for Process Automation Systems
2. ISA 61511-1-(2017) — Functional Safety – Safety Instrumented Systems for the Process Industry Sector Part 1: Framework, Definitions, System, Hardware and Application Programming Requirements
3. ISA 62381-2011 — Automation Systems in the Process Industry – Factory Acceptance Test (FAT), Site Acceptance Test (SAT), and Site Integration Test (SIT)

G. National Fire Protection Association, Inc. (NFPA)

1. NFPA 70-2026 — National Electrical Code (NEC)

H. National Institute of Standards and Technology (NIST)

1. NIST SP 800-82 Rev. 2 (2015) — Guide to Industrial Control Systems (ICS) Security

1.04 SUBMITTALS

A. Refer to Section 26 24 20 – Control Boards.

1.05 DESIGN REQUIREMENTS

A. General Requirements:

1. Provide one valve control PLC assembly. The PLC equipment shall utilize logic functions, memory, timing functions, software, I/O points and communication capabilities for the control and monitoring functions of the system described.
   a. The Valve Control PLC shall provide accurate and reliable control of valve position and pipe flow rates.
2. In accordance with IEEE 802.3, IEEE 802C, IEEE 1249, and IEEE 1379.
3. Failure of PLC and HMI screens shall be fail-safe and alarmed.

B. PLC assembly shall be micro-processor based, capable of the following:

1. Receiving binary and analog inputs.
2. Controlling binary and analog output functions.
3. Capable of accomplishing the control requirements of the specifications.

4. Perform data handling operations and communicate with external network devices.

5. Withstand susceptibility tests in accordance with NEMA ICS 1, NEMA ICS 2, IEC 61131-2, IEEE C37.90.1 and IEEE C37.90.2.

C. PLCs must be labeled as Class A, digital device, under 47 Code of Federal Regulations Part 15.

D. Provide PLC assembly with multiple loop controllers with a scalable process variable for each loop.

E. Design PLC assembly to provide proportional, integral and derivative (PID) control logic.

1. Analog outputs shall be configured as direct acting or reverse acting.

F. PLC

1. Expandable through additional hardware and/or software.

2. Modules grouped together in a mounting rack or cabinet.

G. Environmental:

1. PLC automation control equipment shall be suitable for indoor and outdoor use.

2. PLC Automation control equipment shall be capable of functioning in an ambient temperature ranging from -20 to 70 degrees Celsius (-4 to 158 degrees Fahrenheit), up to 100% relative humidity.

3. Vibration: 2g at 10 to 500 Hertz.

H. Automation Controls Digital Central Processing Unit:

1. CPU shall be a microprocessor based unit that provides the following:

a. Self-contained.

b. Scanning.

c. Application program execution.

d. Storage of application programs.

e. Storage of numerical values related to the application process and logic.

f. I/O bus traffic control.

2. Speed:

a. Processor shall be able to simultaneously run all tasks with a scan time equal to or greater than the time taken for the controller to complete a control loop.

a) The processor loading shall be less than 60 percent while running all specified tasks.

3. Processor program stored in non-volatile memory, so that the program will be saved indefinitely with no external power applied to the processor board.

4. Communications:

a. Ability to communicate with the Valve Automation Control System and components as shown on network diagrams.

b. Communication module shall allow programming of the PLC's locally.

5. Indications:

a. Colored LED indications shall display the operating mode of the processor, i.e. running, programming mode, failure condition, communications active, etc.

I. The PLC assembly shall be capable of the following minimum safety measures:

1. Watchdog function to monitor:

a. Internal processor clock failure.

b. Processor memory failure.

c. Loss of communication between processor and I/O modules.

d. Processor ceases to execute logic program.

2. Safety conditions:

a. Utilize program module to dictate output states in a known and safe manner prior to running of control program.

3. Security:

a. Password protection with lockable key operated selector switches.

4. Provide high noise immunity to prevent occurrence of false logic signals resulting from switching transients, relay and circuit breaker noise or radiated radio frequency interference.

J. Human Machine Interface (HMI) Touch Screen:

1. General Requirements:

a. Provide a series of screens for the control and monitoring of valve electrical components, motors/actuators, and control network components.

b. Design a menu system that provides an easy mechanism to move between different windows with no more than three movements.

c. In accordance with IEEE C37.1 and ISA 101.01.

d. Provide a common way to define and authorize secured actions for a set of users.

e. Provide support for embedded variables to display values that change dynamically at run time.

2. Design alarm annunciator screen displaying real-time alarms that can be sorted, filtered, individually disabled/enabled and silenced based upon multiple criteria such as alarm name, group and time. Provide the following annunciation display:

   a. Historical alarm display functioning similarly to an annunciator window.

3. Design automation control system single-line diagram of the valve system that overlays a summary of the status and analog points.

   a. Control shall not be possible from the single-line window.

4. Provide capability to display the following:

   a. Layout of physical equipment.

   b. Status and analog data.

   c. Control of electrical devices.

   d. Voltage levels.

5. Variable tags shall show a sequence of characters not to be confused with the actual reading when data is not updating.

6. Use of Colors:

   a. Green for open, de-energized or stopped status.

   b. Red for closed, energized or running status.

   c. Yellow for alert or condition out of normal.

K. Provide a surge protection device in accordance with IEEE C62.41.1.

1. Refer to Section 26 24 20 – Control Boards.

1.06 PERFORMANCE REQUIREMENTS

A. Control PLC: Provide control and monitoring for the following:

1. Operation and monitoring of valve actuator to enable precise control of valve position and flowrate, control all electrically operated equipment, monitor all processes and annunciate statuses and alarms.

2. Provide control and monitoring of limit switches, actuator states, equipment faults, actuator position feedback, and flowrate measurements.

3. Perform configuration and programming activities required for a complete and functional system.

4. Provide operator interface, engineering/programming interface, data communication, historization, trending, and I/O processing, integrated into control system.

5. Fully integrated PLC and microprocessor-based system, and have the following minimum features:
   a. PLCs, digital processing units, I/O cards, network switches, power supplies and other peripheral control components.
6. Provide latest hardware, software, and firmware, offered by respective manufacturers at time of award, including:
   a. Automation Control, data and monitoring identified in these Specifications and supplied drawings.
   b. Automation Control, data and monitoring to render a complete, and functional, system which meets, at a minimum the functional intent and requirements stated here-in and provides safe and reliable operation of the facility components under all conditions.
   c. Fully integrated startup, shutdown, and online control system.

B. HMI Philosophy development:
1. Analog indicators.
   a. Display the range of the instrument being displayed, and in that range will be an indicator of the normal process limits.
   b. Above and below the indicator shall be white bands indicating abnormally high and low process values respectively.
   c. Above and below the white bands are dark gray bands which indicate High and Low process values.
2. HMI Trends.
   a. Make trends available and accessible in all HMI applications.
   b. All available information shall be easy to access for operators.
      1) The Y-axis and X-axis of trends shall be automatically ranged to a predetermined scale.
      2) Provide capability to alter the timebase and ranges without the requirement of keystrokes, making use of dragging the cursor to re-range.
3. HMI Colors
   a. Develop a high-performance HMI with colors used and applied consistently.
   b. Background color light gray to mitigate glare, contrast, color interference and operator fatigue.
   c. Foreground colors shall be kept to a minimum with attention to line thickness.

d. Colors shall be used to indicate abnormal conditions to draw the operator's attention quickly.

C. HMI Style development:

1. High-performance design in accordance with ISA 101-01 and ISA TR101.02.
2. Pop-up information-driven display:
   a. Information about each alarm shall be visible to operators.
3. Develop at a minimum four display hierarchies:
   a. Level 1, Overview.
      1) Design to give operators the broadest view of the automation system.
      2) Clear information of the current state.
      3) Key performance indicators.
      4) Ease of navigation to Level 2 displays.
      5) Abnormal conditions and alarms.
   b. Level 2, System and Process Control and Configuration.
      1) Operators shall have ability to select a Level 2 display with a one-click operation.
      2) Include information and controls required to perform tasks called from Level 1.
      3) Provide a clear picture of the system selected from Level 1.
      4) Ability to operate equipment and auxiliary circuits.
      5) Trends such as flow rate.
      6) Detailed diagnostic displays and interlocks, including faults, alarms, or feedback variables.
   c. Level 3, Low-Level Debugging and Commissioning.
      1) Operators shall have ability to select a Level 3 display with a one-click operation.
      2) Display the highest detail for subsystems, sensors, field devices and individual components.
      3) Provide information on PLC processor performance and status of Input and Output channels.
      4) Level 3 shall display advanced troubleshooting, programming and setpoint adjustments.
      5) Provide viewable operating procedures, alarm response instructions and abnormal condition response guidance.

4. Process lines.
   a. Process lines for static equipment shall be dark gray or black, with line thickness used to differentiate significance.
   b. When using different line styles for solid, dotted and dashed.
      1) Limited to a maximum of three styles with the same line thickness.
   c. Process lines shall enter and exit the screen consistently.

D. HMI interface development:
1. Process flow and navigation:
   a. The process flow development shall be consistent in layout across all screens.
2. Static texts and live data:
   a. Utilize simple font and color that is easily displayed on screen.
   b. Abbreviations must be consistent across the entirety of all systems.
   c. Use larger texts to identify duplicated equipment such as multiple motors.
   d. Isolated words, titles, device and equipment designations shall all be uppercase.
   e. Live data shall be depicted distinctly from static text.
   f. If live data is shown in a table, align the numbers on the decimal point and do not display leading zeros.
   g. When required, the units of measurement are displayed in lower contrast and adjacent to the live data value.

1.07 EXTRA MATERIALS

A. Spare Parts:
1. Deliver spare parts to locations as determined by COR.
2. Deliver spare parts within seven days prior to installation of those parts for which spares are required.
3. Furnish spare parts listed in Table 25 12 10A – Spare Parts.

Table 25 12 10A - Spare Parts

Item	Description	Quantity
1	PLC	1 of each type
2	AC Power Supply	1 of each type
3	I/O Modules	1 of each type
4	Communication Modules	1 of each type

5	HMI	1 of each type
7	Control Power Transformer	1 of each type

PART 2 PRODUCTS

2.01 PROGRAMMABLE LOGIC CONTROLLER

A. Provide PLC assembly, process modules, peripherals and accessories as required to provide specified functionality.

B. Communication Capability:

1. In accordance with:
   a. IEEE 754, 802.3, and 1815.
   b. TIA/EIA 485 and 598.
2. Ethernet/IP.
3. Modbus TCP.
4. RJ-45 Ethernet 10baseT connection for technician to monitor, download, and upload application programs.
5. Modbus RTU mode protocol over RS-232 via TIA/EIA 485 connection.

C. Empty slots in the chassis shall include cover plates.

D. PLC: Model Allen-Bradley CompactLogix 5370, 1769-L24ER-QBFC1B, manufactured by Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204; or equal, having the following essential characteristics:

1. Provide hardware, software, and design to provide fully functional bi-directional data links to other systems, components, PLCs, PACs, and networks as required.
2. Two Ethernet Ports
3. Memory Storage:
   a. Memory Capacity: 750KB, minimum, with the option for expandable storage to meet spare capacity requirements.
   b. Provide additional RAM and memory storage as required to support device functionality.
4. Power Voltage: 24 VDC
5. Provide capability of programming control logic using the following programming languages, in accordance with IEC 61131-3:
   a. Ladder Diagram.

b. Function Block Diagram.

c. Structured Text.

6. Processor, Communications, and I/O configurable modules based on hard-wired and TCP/IP connected equipment.

7. Provide the controllers with a minimum of 40 percent spare capacity, including memory utilization, processing capacity, and other functions.

8. I/O:

a. Provide I/O as required to meet specified functionality.

b. Provide 10 percent spare installed I/O of each size and type at each I/O location.

9. System shall provide support for the following minimum communication protocols:

a. Modbus Serial (RTU and ASCII).

b. Modbus Network (TCP).

c. HART (as required).

10. Certified in accordance with IEC 60068-2-1 and IEC 60068-2-2.

11. Certified in accordance with IEC 60068-2-14 for Operating and Storage Temperature as follows:

a. Operating Temperature: Minus 20 to Plus 140 degrees F.

b. Storage Temperature: Minus 40 to Plus 185 degrees F.

12. Certified in accordance with IEC 60068-2-30 for relative humidity of 5 to 95 percent, non-condensing.

13. Surge Immunity: 1kV line to line; 2kV line to earth as defined by IEC 61000-4-5.

2.02 POWER

A. Provide power distribution system to all supplied components, including overcurrent and surge protection, to support full operation of the system. This distribution system shall include analog loop power supplies and contact interrogation voltages for dry contact inputs where required.

B. Control power shall be 120 VAC.

C. Self-diagnostic capability to determine internal faults and annunciate alarms.

D. Failure of any power supply or power feed shall result in a system alarm.

E. Surge Immunity: 1kV line to line; 2kV line to earth as defined by IEC 61000-4-5.

F. Voltage Variation: +/- 20 percent as defined by IEC 61000-4-11.

G. AC Power Supply:

1. Type: Din-Rail mountable.
2. Input Voltage: 100-240 VAC.
3. Operating Temperature Range: Minus 25 to Plus 70 degrees Celsius (-13 to 158 degrees Fahrenheit).

H. DC Power Supply:

1. Type: Din-Rail mountable.
2. Input Voltage: 100-240 VAC.
3. Output Voltage: 24 VDC plus-and-minus 1 percent.
4. Output Current: 10 amps, minimum.
5. Power Dissipation, Max: 4.0 Watts.
6. Connection Type: Screw.
7. Operating Temperature Range: Minus 25 to Plus 70 degrees Celsius (-13 to 158 degrees Fahrenheit).

I. Fuse Holder and Fuses:

1. DIN-Rail mountable.
2. Fuse:
   a. Rated for size required.
   b. Class CC.

2.03 COMMUNICATION MODULES

A. As necessary to communicate to HMI and to Leavenworth Hatchery Main Facility via Radio.

2.04 PLC APPLICATION PROGRAM

A. Refer to Section 26 24 20 – Control Boards.

2.05 HMI GRAPHIC DISPLAYS

A. HMI:

1. Power: 120 VAC.
2. Display Dimensions:
   a. 7”, minimum.
3. Touch Screen Control

4. Host Port: One USB 2.0 high-speed (type A)
5. Device Port: One USB 2.0 high-speed (type B)
6. Capable for flush panel mounting.
7. Compatible with PLC.

2.06 CONTROL ENCLOSURE

A. Refer to Section 26 05 33 – Raceways and Boxes.

2.07 SURGE PROTECTION DEVICE

A. Refer to Section 26 24 20 – Control Boards.

2.08 SOURCE QUALITY CONTROL

A. Government reserves the right to inspect equipment at supplier's manufacturing plant prior to final testing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform installation in accordance with requirements in NFPA 70 and reference standard drawing 40-D-60001.

B. Provide grounding in accordance with Section 26 05 26 – Grounding and Bonding, NFPA 70, and IEEE 3003.2.

C. Cable and Wiring: Provide cable and wiring in accordance with Sections 26 05 02 – Basic Electrical Materials and Methods and 26 05 10 – Conductors and Cables.

D. Installation shall be completed in a neat and workmanlike manner in accordance with NFPA 70.

3.02 SITE ACCEPTANCE TEST

A. Refer to Section 26 24 20 – Control Boards.

END OF SECTION

DIVISION 26 – ELECTRICAL

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SECTION 26 05 02
BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Complete Electrical System:

1. Payment: Lump-sum price offered in the Price Schedule.
   a. Including but not limited to: Supports, conductors, grounding, cables, raceways and boxes.
   b. Include radio path study. Refer to Section 26 24 20 – Control Boards.
   c. Does not include removal of existing electrical equipment. Refer to Section 02 41 10 – Selective Site Demolition.

1.02 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)

1. ASME BPVC-IX 2019 — Boiler and Pressure Vessel Code, Section IX – Welding and Brazing Qualifications

B. ASTM International (ASTM)

1. ASTM A 123/A 123M-17 — Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM A 153/A 153M-16a — Zinc Coatings (Hot-Dip) on Iron and Steel Hardware

C. International Code Council (ICC)

1. IBC-2018 — International Building Code (IBC)

D. Institute of Electrical and Electronics Engineers (IEEE)

1. IEEE C2 — National Electrical Safety Code (NESC)

E. InterNational Electrical Testing Association, Inc. (NETA)

1. NETA ATS-2017 — Acceptance Testing Specifications

F. National Fire Protection Association (NFPA)

1. NFPA 70-2026 — National Electrical Code (NEC)

1.03 SYSTEM DESCRIPTION

A. Design and provide all required cable, conductor and raceway interconnection required for all equipment and components included for this contract:

1. Includes power, control, and other cable interfaces required between equipment provided for this contract and all external interfaces required in these Specifications.

B. Design and provide grounding system for exterior areas as specified in these Specifications.

C. Design and provide supports for all supplied electrical components and enclosures as required for a complete installation.

D. Provide installation in accordance with IBC seismic requirements for the installation location.

E. Maintain equipment and installation from Contractor mobilization to the site until Final Acceptance of the installation. Including:

1. Performing all equipment manufacturer recommended and required maintenance activities at a minimum within the time durations and schedule recommended by manufacturer.
2. Provide power source and operate all equipment heaters intended to prevent condensation. All heaters located in electrical or control equipment shall be considered required to prevent condensation.
3. Provide temporary weatherproofing for components exposed to moisture or outdoor conditions which are not rated for those conditions. This requirement includes components located onsite prior to installation. Weatherproofing should be in accordance with manufacturer's recommendations.
4. Perform maintenance inspections of equipment and components installed or located at the site a minimum of every three months. Inspections should verify operation of equipment heaters and the condition of equipment and any weatherproofing provided for equipment.

1.04 QUALIFICATIONS

A. Welder Qualifications: In accordance with ASME BPVC-IX.

B. Field testing organization and personnel: As specified in NETA ATS, Section 3, except may be accredited by other than NETA.

1.05 MAINTENANCE

A. Provide special tools and accessories required for installation or normal operation and maintenance of equipment and installations. Studs, bolts, or nuts other than United States

Standard provided anywhere in the equipment or installation will be considered as requiring special tools.

B. Deliver special tools and spare parts for equipment to Leavenworth National Fish Hatchery or to a location approved by COR. Provide shipments with item list(s).

C. Special tools and spare parts must be onsite prior to installation of equipment.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Conform to NFPA 70, IEEE C2, and Section 01 60 00 – Product Requirements.

B. Where nameplates are required provide engraved nameplates of appropriate size. Conform to drawing 40-D-6234 using Type A material. Nameplate engraving to be as required and as listed below:

1. Provide nameplate for each Contractor-supplied enclosure.
2. Provide engraved nameplate for each Contractor-installed door mounted device mounted on an enclosure door not furnished with manufacturer's nameplate.

C. Galvanize mounting brackets, bolts, nuts, and washers for major items of electrical equipment in accordance with ASTM A123 and ASTM A153.

D. Provide galvanized steel or non-corrosive metal for mounting bolts, nuts, and washers for minor items of electrical equipment and lighter weight items. Do not use cadmium-plated mounting hardware.

E. Change designs as required where Contractor-furnished electrical equipment and materials differ in size, type, ratings, or other physical properties from designs in these specifications. Contracting Officer will approve changes at Contractor's expense, unless Contractor can demonstrate that changes are necessary regardless of manufacturer.

F. Provide special tools and appliances furnished by manufacturer for maintenance and adjustment of manufacturer's electrical equipment.

PART 3 EXECUTION

3.01 INSTALLATION

A. Do not install electrical equipment until approval drawings and data for associated equipment have been approved by Government.

B. Electrical Installations, Assembly Operations, and Adjustments: Comply with NFPA 70 and IEEE C2.

C. Make electrical installations complete and ready for service.

D. Install electrical equipment in accordance with directions furnished by manufacturer's instruction books.

E. Tighten nuts used in electrical equipment assembly with torque wrenches to torque values recommended by equipment manufacturers.

F. Drill holes in bolted steel structures and provide fastenings required for mounting or installing electrical equipment and materials.

G. Do not drill holes in tubular steel structures. Fasten to tubular steel structures by means of properly drilled and tapped pads or brackets welded to tubular members.

H. Supports:

1. Electrical Enclosure and Control Panel Floor Mounted Supports:

a. Provide in accordance with drawing 40-D-60001, unless alternate support arrangement is required due to specific component layout or support loading requirements.

2. Provide other supports for electrical components and enclosures as required for installation.

I. Installation of electrical equipment includes:

1. Leveling and grouting channel bases.

2. Drilling holes, furnishing hardware, and assembling components to each other.

3. Furnishing materials for and making all connections correctly in accordance with final wiring diagrams.

4. Tagging wires and cables at each end.

J. Grout electrical equipment installed on concrete foundations in place to provide full and even bearing.

3.02 REPAIR

A. Repair damaged painted surfaces of equipment to match original finish.

3.03 FIELD QUALITY ASSURANCE

A. Government will inspect electrical equipment during construction. Acceptance of equipment will be made after equipment is operational.

B. All equipment field tests to be witnessed by Government. Provide proof of Government witness on field test reports.

END OF SECTION

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SECTION 26 05 10
CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of conductors and cables in the lump-sum price offered in the Price Schedule for Complete Electrical System.

1.02 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

1.	MC96.1-1982	Temperature Measurement Thermocouples

B. ASTM International (ASTM)

1.	ASTM B8 - 2011(2017)	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
2.	ASTM B496 - 2016	Compact Round Concentric-Lay-Stranded Copper Conductors

C. Insulated Cable Engineer Association (ICEA)

1.	ICEA S-87-640-16	Optical Fiber Outside Plant Communications Cable
2.	ICEA S-90-661-12	Category 3, 5, and 5e Individually Unshielded Twisted Pair Indoor Cables for Use in General Purpose and LAN Communications Wiring Systems
3.	ICEA S-116-732-13	Standard for Category 6 and 6A, 100 Ohm, Individually Unshielded Twisted Pairs, Indoor Cables (With or Without An Overall Shield) for Use In LAN Communication Wiring Systems

D. Institute of Electrical and Electronics Engineers (IEEE)

1.	IEEE 1202 - 2006	Standard for Flame – Propagation Testing of Wire & Cable
2.	IEEE C2	National Electrical Safety Code (NESC)

E. International Standards Association

1.	ISO 11801-2002	Information Technology – Generic Cabling for Customer Premises

F. National Electrical Manufacturers Association (NEMA)

1.	NEMA WC 57 - 2014	Standard for Control, Thermocouple Extension, and Instrumentation Cables
2.	NEMA WC 70 - 2009	Power Cables Rated 2000V or Less for the Distribution of Electrical Energy

G. National Fire Protection Association (NFPA)

1.	NFPA 70 - 2026	National Electrical Code (NEC)

H. Telecommunications Industry Association (TIA)

1.	TIA 568.0-Rev.D - 2015	Generic Telecommunications Cabling for Customer Premises.
2.	TIA 568.1-Rev.D - 2015	Commercial Building Telecommunications Infrastructure Standard
3.	TIA 568.2-Rev.C - 2018	Balanced Twisted-Pair Telecommunications Cabling and Components Standards
4.	TIA 568.3-Rev.D - 2016	Optical Fiber Cabling Components Standard
5.	TIA 568.4-Rev.D - 2017	Broadband Coaxial Cabling and Components Standard
6.	TIA 598-Rev.D - 2014	Optical Fiber Cable Color Coding
7.	TIA-1152-Rev.A - 2016	Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

I. Underwriters Laboratories, Inc. (UL)

1.	UL 486B - 2013	Wire Connectors
2.	UL 1581 - 2001	Standard for Electrical Wires, Cables, and Flexible Cords
3.	UL 1685 - 2015	Standard for Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals and Section 01 33 26 - Electrical Drawings and Data.

B. RSN 26 05 10-1, Approval Data:

1. Manufacturer's technical catalog data.

C. RSN 26 05 10-2, Construction Documentation

1. Test Reports and Wire Termination Sheets.

a. Provide test reports for each cable provided by the Contractor.

1.04 DEFINITIONS

A. Cable: Cable, cables, wire, or wires of one or more insulated conductors.

B. Power Cable: For power loads; motors; alternating- and direct-current distribution circuits; heating, ventilating, and air-conditioning circuits; and cable that is used for controlling heating, ventilating and air-conditioning equipment. Utilized for cable operating voltages 600 volts and below.

C. Building Premises Wire: For connection of lighting system and power receptacle components below 277 volts.

D. Control Cable: For control, metering, indication, annunciation, and relaying circuits; and circuits not identified as power circuits. Utilized for cable operating voltages below 600 volts.

E. Instrumentation Cable: Power limited cable for RTD, transducer output circuits, and can be used for serial communication (RS-232 & RS-485).

F. Telecommunications Cable: For supervisory computer control, voice communication, and logic level signals. (fiber, Ethernet, coax, etc.)

G. Enclosure Wiring: For wiring inside of enclosures or control boards.

1.05 PERFORMANCE REQUIREMENTS

A. Determine conductor sizes, except where shown or specified, in accordance with NFPA 70. In the event of conflict between design requirements and NFPA 70, the more stringent requirement applies.

B. Verify conductor sizes where shown are provided appropriate for the equipment under this contract. Provide conductor sizes and types appropriate for the electrical load and installation conditions where used.

C. Provide conductors and cables where required for a complete and functional system. Existing cables and wiring requiring Contractor modified connections may not be reused.

PART 2 PRODUCTS

2.01 CABLE, GENERAL

A. Manufactured no more than 24 months prior to Notice to Proceed.

B. Conductors:

1. Copper in accordance with ASTM B8, class B or C.
2. Stranded conductors, except for solid conductor building premises wire.
3. Round shape, unless specified otherwise.

C. AWG or kcmil designation.

D. UL listed and labeled.

E. Color Coding:

1. Provide color coding via colored insulation or jacket compound. Do not apply color coatings to insulation or jacket surface.
2. Phase Conductors
   a. Single-Conductor:
      1) 120/240, single-phase: Black.
      2) 120/208 or 240 volt. 3-phase: Black, red, blue. Colored phase tape may be used in lieu of colored insulation.
      3) 277/480 volt: Black. Provide brown, orange, yellow colored phase tape.
   b. Multi-Conductor:
      1) Utilize NEMA WC57 Table E2 for cables with conductors 8 AWG and smaller.
      2) 120/240, single-phase: NEMA WC 57 Table E2.
      3) 120/208 or 240 volt. 3-phase: NEMA WC 57 Table E2.
      4) 277/480 volt: NEMA WC 57 Appendix E Method 4. Provide brown, orange, yellow colored phase tape.
3. Direct Current (Ungrounded) Conductors:
   a. 125-volt DC positive bus: Red.
   b. 125-volt DC negative bus: Black.
4. Neutral (Grounded) Conductors: In accordance with NFPA 70.
5. Equipment Grounding Conductors:
   a. 6 AWG and smaller: Green insulation.

b. Larger than 6 AWG: Green tape at both ends and visible points including junction boxes.

6. Control Cable:

a. In accordance with NEMA WC 57, Table E-2.

7. Instrumentation Cable

a. Sequentially number each pair/triad for identification.

8. Thermocouple Extension Cable

a. In accordance with ANSI MC 96.1.

b. Sequentially number each pair for identification.

9. Telecommunications Cable

a. Fiber Optic Cable: In accordance with TIA 598.

b. Category 4, 5e and 6 Cable: In accordance with TIA 568.

2.02 POWER CABLE

A. 600 volt rated insulation unless specified otherwise.

B. Single-conductor power cable in accordance with NEMA WC 70. Multi-conductor cable in accordance with NEMA WC 57.

C. Conductors:

1. Copper in accordance with ASTM or B496, class B or C.

2. Stranded conductors.

3. Minimum Conductor Size:

a. Single Conductor Cable: 12 AWG.

b. Multi-Conductor Cable: 14 AWG.

4. Conductor sized according to application requirements, and in accordance with the requirements and recommendation in the NEC, including derating of the cable ampacity for conditions where the cable will be installed. Cable sizing shall be based on an ambient temperature of 104º F /40º C, unless actual conditions require a higher ambient temperature.

D. Type.

1. Single-conductor or multi-conductor, non-shielded type.

2. Suitable for wet or dry location, indoors or outdoors.

3. Suitable for installation in above grade or underground raceway.

4. Suitable for direct burial installation when required by specifications or installation location.

5. Suitable for installation in vertical position without injury to covering or deformation of insulation when supported in accordance with NFPA 70.

E. Rated for a minimum of 194º F/90º C continuous operating temperature, Wet or Dry.

F. Insulation Type: THHN/THWN or XHHW.

1. EPR, XLPE, or equal.

G. Overall Jacket:

1. Type: CPE (Chlorinated Polyethylene) or better, flame-retardant.
2. UV Resistant.
3. Includes rip-cord for single conductor cables.

H. Flame Test Rating:

1. IEEE 1202 or UL 1685.

I. Round, except for 2-conductor cable with parallel conductors.

J. Small diameter conductors (1/0 AWG and smaller) shall be grouped into multi-conductor cables including overall jackets, unless specified otherwise.

2.03 CONTROL CABLE

A. 600 volt rated insulation unless specified otherwise.

B. Multi-conductor cable in accordance with NEMA WC 57.

C. Conductors:

1. Copper in accordance with ASTM or B496, class B or C.
2. Stranded conductors.
3. Minimum Conductor Size:
   a. Multi-Conductor Cable: 14 AWG.
   b. Conductors used for Current Transformer (CT) or Potential Transformer (PT) applications shall have minimum conductor sizes of 10 AWG for CT applications and 12 AWG for PT applications.

D. Conductor sized according to application requirements, and in accordance with the requirements and recommendation in the NEC, including derating of the cable ampacity for conditions where the cable will be installed. Cable sizing shall be based on an ambient temperature of 104º F/40º C, unless actual conditions require a higher ambient temperature.

E. Type:

1. Single-conductor or multi-conductor, shielded type.
2. Suitable for wet or dry location, indoors or outdoors.
3. Suitable for installation in above grade or underground raceway.
4. Suitable for direct burial installation when required by specifications or installation location
5. Suitable for installation in vertical position without injury to covering or deformation of insulation when supported in accordance with NFPA 70.

F. Rated for a minimum of 194º F/90º C continuous operating temperature, Wet or Dry.

G. Insulation Type: THHN/THWN or XHHW.
   1. EPR, XLPE, or equal.

H. Overall Jacket:
   1. Type: CPE (Chlorinated Polyethylene) or better, flame-retardant.
   2. UV Resistant.
   3. Includes rip-cord for single conductor cables.

I. Shield
   1. Conform to NEMA WC 57.

J. Flame Test Rating:
   1. IEEE 1202 or UL 1685.

K. Round, except for 2-conductor cable with parallel conductors.

L. Small diameter conductors (1/0 AWG and smaller) shall be grouped into multi-conductor cables including overall jackets, unless specified otherwise.

2.04 BUILDING PREMISES WIRE

A. 600 volt rated insulation unless specified otherwise.

B. Single, solid conductor in accordance with NEMA WC 70.

C. Conductors:
   1. Minimum Conductor Size:
      a. Minimum size 14 AWG.
   2. Conductor sized according to application requirements, and in accordance with the requirements and recommendation in the NEC.

D. Type:

1. Single-conductor non-shielded type.
2. Suitable for installation in raceways and in locations where installed.

E. Insulation Type:

1. THHN/THWN or XHHW.

2.05 INSTRUMENTATION CABLE

A. Cable in accordance with NEMA WC 57.

B. Conductors:

1. Copper in accordance with ASTM 8, class B or C.
2. Stranded conductors.
3. Minimum Conductor Size:
   a. Minimum size 18 AWG.
   b. Conductor sizes to 22 AWG allowed for serial communications applications.
4. Conductor sized according to application requirements, and in accordance with the requirements and recommendation in the NEC.

C. Type:

1. Single-pair or triad shielded, or multiple individual shielded pairs or triads with overall shield.
2. Suitable for installation in above grade or underground raceways.
3. Suitable for direct burial installation when required by specifications or installation location.
4. UL listed type PLTC.
5. Suitable for installation in vertical position without injury to covering or deformation of insulation when supported in accordance with NFPA 70.

D. Rated for a minimum of 194º F/90º C continuous operating temperature, Wet or Dry.

E. Insulation:

1. EPR, XLPE or equal.
2. 300 volts, minimum.

F. Shield

1. Pair/Triad Shield:

a. Required for each pair/triad.

b. Aluminum-mylar tape providing 100 percent coverage with a tinned, stranded copper drain wire.

2. Overall Shield:

a. Required for multi-pair or multi-triad cables.

b. Aluminum-mylar tape providing 100 percent coverage with a tinned, stranded copper drain wire.

G. Jacket:

1. CPE (Chlorinated Polyethylene) or better, flame-retardant with rip-cord.

2. Sunlight and moisture resistant.

H. Flame Test Rating:

1. IEEE 1202 or UL 1685.

2.06 ENCLOSURE WIRING

A. Wiring inside switchboards, control panels, etc., not intended for use extending outside of the enclosure. Enclosure wiring for instrumentation or telecommunications shall maintain characteristics of those cable types.

B. Minimum 600-volt rated insulation.

C. Type:

1. NEC type SIS.

D. Minimum Conductor Size:

1. 14 AWG

2. Conductor sized according to application requirements, and in accordance with the requirements and recommendation in the NEC.

E. Insulation Type

1. XLPE, or equal.

F. Insulation Color:

1. White or Grey, unless special purpose application.

G. Flame Test Rating:

1. UL 1581 VW-1

2.07 TELECOMMUNICATIONS CABLE

A. Approved Types of Telecommunications Cable:

1. Fiber Optic Cable (Single Mode)

a. Provide cable in accordance with ICEA S-87-640, as appropriate.

b. Cable performance shall not be impacted by immersion in water.

c. UL listed, where available.

d. Color Coding: Per TIA -598.

e. Single Mode Fiber Optic Cable

1) Gel Free/Stranded Loose Tube.

2) Rod Filler: Central dielectric strength member.

3) Cable core: Symmetrically stranded buffer tubes around dielectric central member.

4) Water blocking.

5) Suitable for installation in innerduct.

6) Major cable components:

a) 2.5 millimeter Gel-Free Buffer Tubes.

b) 250 micro Fibers.

c) Dielectric Strength Member.

7) Optical fibers:

a) Bend Insensitive Single-mode Fiber.

b) Quantity of fibers as shown on supplied drawings and as required to complete the installation.

8) Jacket:

a) Type: CPE (Chlorinated Polyethylene) or better, UV resistant, flame-retardant.

9) Strength members: With expansion and contraction characteristics similar to glass fibers.

10) Buffer tubes:

a) Protect each fiber in a buffer tube of loose-tube type construction.

b) Color coded.

11) Optical fibers:

a) Attenuation of 1310/1383/1550 nanometer wavelength light: Less than 0.5/0.5/0.4 decibels per kilometer.

b) Attenuation: Directly proportional to cable length for an arbitrary cable length section after steady-state conditions are reached.

c) Color coded.

12) Bend Radius.

a) Loaded: 7.7-inch.

b) Unloaded: 5.1-inch.

13) Cable tensile strength:

a) Long term (installed): 135 pounds per foot.

b) Short term (during installation): 600 pounds per foot.

14) Operating temperature range: Minus 40 to 150 degrees F.

B. Fiber Optic Patch Cable (Single Mode)

1. Type fiber: single-mode.
2. Length: As required.
3. Connectors: As required to connect to fiber optic equipment.
4. Loss per connector: Less than 0.5 decibels.

C. Category 3 (CAT 3) Cable

1. Provided per TIA-568-C.2 and ICEA S-90-661.
2. Conductors:

a. Copper.

b. Minimum Conductor Size:

1) Minimum size 22 AWG.

D. Category 5e (CAT 5e) cable with RJ45 connections.

1. Provide in accordance with TIA 568 and ICEA S-90-661.
2. Cable jacket: Halogen free, resistant to abrasion, moisture, weather, and environmental cracking.
3. Type:

a. UL listed CMR cable, unless otherwise required for installation conditions.

b. Single twisted pair, or multiple individual twisted pairs. Quantity of pairs as required for application.

c. Suitable for installation in above grade or underground raceways.

4. Rated for a minimum of 140º F/60º C continuous operating temperature, Wet or Dry.

5. Insulation:

a. PVC or equal.

6. Jacket:

a. PVC (Polyvinyl chloride) or equal with rip-cord.

b. Moisture resistant.

7. Flame Test Rating:

a. UL 1666 Riser.

8. Provide communications rated cabling for the installation purpose it is installed (plenum, riser, etc.) in accordance with NFPA 70.

E. Category 6 (CAT 6) cable with RJ45 connections.

1. Provide in accordance with TIA 568.

2. Cable jacket: Halogen free, resistant to abrasion, moisture, weather, and environmental cracking.

3. Type:

a. UL listed CMR cable, unless otherwise required for installation conditions.

b. Single twisted pair, or multiple individual twisted pairs. Quantity of pairs as required for application.

c. Suitable for installation in above grade or underground raceways.

4. Rated for a minimum of 140º F/60º C continuous operating temperature, Wet or Dry.

5. Insulation:

a. PVC or equal.

6. Jacket:

a. PVC (Polyvinyl chloride) or equal with rip-cord.

b. Moisture resistant.

7. Flame Test Rating:

a. UL 1666 Riser.

8. Provide communications rated cabling for the installation purpose it is installed (plenum, riser, etc.) in accordance with NFPA 70.

F. Special Purpose Cable

1. With the approval of the COR.

2.08 ACCESSORIES

A. Single Conductor Markers:

1. Type: Heat-shrink or Self-laminating-vinyl type, machine printable sleeve.
2. Color: White with black text.
3. Text size: As large as practical but at least 7 point (0.06 inch).
4. Be 1 inch in length, minimum, and have diameter suitable for installation on the intended conductor.

B. Multi-conductor Cable Tags:

1. Type: Cross-laminated polyethylene film or Nomex®. Be resistant to water, oil, solvent, abrasion, and tearing.
2. Rectangular shape and have minimum dimensions of 2 by 0.5 inches.
3. Color: White with black text.
4. Text size: As large as practical but at least 16 point (0.16 inch).
5. Attach to cable with standard nylon self-locking tie wraps or cable ties.

C. Polyethylene warning tape.

1. Width: 6 inches.
2. Color: Red.
3. Copy: Continuously imprinted with "CAUTION BURIED ELECTRIC LINE BELOW".
4. Suitable for direct burial.

D. Terminal connectors for control and instrumentation cable:

1. Heavy-duty, nylon insulated sleeve, pressure-crimp-type with ring tongues.
2. Install pin pressure-crimp-type connectors for terminations where the use of ring tongue is not practical such as terminations at selector switches, pushbuttons, indicating lamps, or auxiliary relays.
3. Tin-plated copper.
4. Serrated inner barrel.
5. UL listed.
6. Compatible with conductor size and type of cable for which it is used.

E. Telecommunications Cable Faceplates and Connectors:

1. Connectorize fiber cables and connect to patch panels using ST type connectors. Make connections to components as required be component terminal.
2. Provide patch cords to connect dielectric fiber cable to fiber optic equipment.
3. Terminate unshielded twisted pair (UTP) cables in accordance with TIA-568-C.1 and TIA-568-C.2 with T-568A color configuration.
4. Use registered jack (RJ) 45 modular connector.
5. Provide each location with 2 port RJ-45 faceplates unless otherwise noted on drawings.
6. Faceplate color shall be white.

F. Fiber Optic Cable Patch Panels:

1. Type: Rack mount or wall mount.
2. Metal housing with splice tray holder, splice tray, adaptor plates, and radius limiters.
3. Splice Trays:
   a. Same manufacturer as housing.
   b. Fusion splice organizer to retain each splice and its shrink tubing.
   c. Manufactured for loose tube type fiber optic cable.
4. Adaptor Plates:
   a. Same manufacturer as enclosure.
   b. Mount at minimum 6 fibers.
   c. Use ST connectors.

G. Innerduct Duct Liners:

1. Conform to UL 2024 and applicable ASTM standards.
2. UL Riser-Rated.
3. Size: 1-inch.
4. Flexible.
5. Non-metallic.
6. Corrugated.
   a. Sequential marked footage.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NFPA 70, IEEE C2, TIA 568 and manufacturer's requirements and recommendation.

B. Maintain manufacturer recommended minimum bending radius for cables.

C. Install all telecommunications cables in raceway, or similar protected installation.

D. Provide circuit raceway in accordance with Sections 26 05 33 - Raceway and Boxes.

E. When using cable ties, do not over tighten, to ensure tie does not cut conductor insulation or cable outer jacket. Do not use cable ties to support cables.

F. Seal cable penetrations into equipment or passing through blockouts, with silicone-foam, fire-retardant type material.

G. Install cable in a neat and workmanlike manner in accordance with industry standards and manufacturer requirements.

H. Use building premises wire for lighting circuits and 120 volt receptacles unless shown otherwise.

I. Cable Separation

1. Install cables to provide separation of voltage levels, defined below, except with approval of the COR.
2. Voltage Levels
   a. Medium Voltage: Above 600 volt operating voltage.
   b. Single-Conductor Power Cable: 64V operating voltage and above.
   c. Power & Control: 64V operating voltage and above.
   d. Instrument Level: Below 64V operating voltage.
3. Do not mix voltages within a cable.
4. Do not install cables of different voltage levels in the same raceway.
5. Do not install cables of different voltage levels in the same cable tray unless separated by a barrier in the cable tray.

J. Cable Splicing:

1. Do not splice cables.

K. Cable Installed In Conduit:

1. Do not pull cable into conduit until they have been cleaned and are free from obstructions and sharp corners.
2. Draw a clean, dry, tight-fitting rag through conduit immediately before installing cable.
3. Install cable using gradual and uniform pulling stresses. Do not exceed allowable pulling tensions and sidewall pressures as recommended by cable manufacturer.
4. Install cable to prevent cuts or abrasions in insulation or protective covering and kinks in cable.
5. When a lubricant is needed as an aid to pulling, use only soapstone or other suitable lubricant that is not injurious to cable insulation.
6. When mechanical cable pulling equipment is used, use a tension meter release mechanism to ensure pulling tension remains below tensile strength of the cable.
7. Remove and replace any cable damaged during installation.

L. Cable Installed In Vertical or Inclined Plane:

1. Support with cable grips leaving slack spans between supports.
2. Clamp cable entering enclosures, junction boxes, or equipment with commercial cable clamps.
3. Cables shall not be installed in an open air drop of greater than 4 feet without explicit approval of the COR. Open air drop shall not exceed manufacturers maximum recommended distance or NFPA 70 guidelines for the installed cable type.

M. Cable in Boxes and Enclosures

1. Provide slack in the cable in all boxes, and enclosures. The cable should not be pulled tight against any edge or component in the enclosures and boxes.
2. If a cable is terminated in the box or enclosure include enough spare length in the terminated conductor to reach any other terminal in the enclosure. In multi-panel control cabinets the conductor should be able to reach any other terminal within that panel of the enclosure.

N. Direct buried cables:

1. Install in accordance with Standard Drawing 40-D-5370.

O. Buried cables not within fenced yard areas:

1. Depth: 24 inches, minimum.
2. Install by trenching method. Do not plow cables in.
3. Surround cables by 2 inches of sand, minimum.
4. Install polyethylene warning tape 18 inches above cable.

P. Fiber optic cables:

1. Innerduct Duct Liners:
   a. Where fiber optic cable is installed in conduits or ducts install cable in one inch innerduct. Fiber optic cable shall be compatible with innerduct and lubricants provided.
   b. Provide pulling tape in each innerduct duct liner.
2. Termination:
   a. Terminate fiber optic cable installed between enclosures or building at patch panels.
   b. Coil 5 feet of fiber cable inside each patch panel.
   c. Leave spare fibers in each patch panel.
   d. Retain fibers at each cable end equal in length to longest single fiber.
3. Provide fiber optic coils inside pull boxes, junction boxes, and other electrical and control enclosures, and where recommended by the manufacturer.
4. Clamp cable entry with fiber type cable clamp.

Q. CAT 3 cables:

1. Install in accordance with BICSI-TDMM, TIA-568-C.2, NFPA 70, and UL standards as applicable.
2. Install per manufacturer's instructions and do not exceed manufacturers' cable pull tensions for copper cables.
3. Install back boxes for RJ-45 connectors.
4. Do not install power and communication cable in same conduit.
5. No cable shall contain unterminated elements.
6. Do not untwist Category 6 cables more than 1/2-inch from point of termination to maintain cable geometry.
7. Terminate networking cables in T568A configuration per TIA-568-C.2.

R. CAT 5 and 5e cables:

1. Install in accordance with BICSI-TDMM, TIA-568-C.2, NFPA 70, and UL standards as applicable.
2. Install per manufacturer's instructions and do not exceed manufacturers' cable pull tensions for copper cables.
3. Install back boxes for RJ-45 connectors.
4. Do not install power and communication cable in same conduit.
5. No cable shall contain unterminated elements.

6. Do not untwist Category 6 cables more than 1/2-inch from point of termination to maintain cable geometry.
7. Terminate networking cables in T568A configuration per TIA-568-C.2.

S. CAT 6 cables:

1. Install in accordance with BICSI-TDMM, TIA-568-C.2, NFPA 70, and UL standards as applicable.
2. Install per manufacturer's instructions and do not exceed manufacturers' cable pull tensions for copper cables.
3. Install back boxes for RJ-45 connectors.
4. Do not install power and communication cable in same conduit.
5. No cable shall contain unterminated elements.
6. Do not untwist Category 6 cables more than 1/2-inch from point of termination to maintain cable geometry.
7. Terminate networking cables in T568A configuration per TIA-568-C.2.

T. Grounding.

1. Provide 1 nonactive conductor grounded at both ends in each multi-conductor control cable.
2. Ground shielding of each shielded control cable on both ends directly to equipment ground bus.
3. Ground shielding of instrumentation and telecommunications cable only to source equipment ground bus.
4. Ground spare conductors by wire jumpers from equipment terminal block points to equipment ground bus.

U. Wiring methods:

1. Terminate control, instrumentation, and telecommunications cable with appropriate terminal connectors.
2. At termination point of multi-conductor cable, form conductors into neat packs and tie conductors with self-locking cable ties.
3. Make connections at device terminals or terminal blocks. Maximum two wires at terminations.
4. Termination of wire without terminal connector is not acceptable.
5. Form wiring into compact groups bound together and firmly supported. Run wiring groups straight, horizontally, or vertically with short-radius, right-angle bends.

6. Support and secure wire bundles with cable tie mounting bases. Secure cable tie mounting base with two No. 8 screws. Mounting cable tie bases with only adhesive will not be allowed.
7. Group wires at terminal blocks to minimize number of external cables.
8. Install 3-phase leads at adjacent terminals.
9. Do not combine alternating- and direct-current circuits, or current and potential transformer circuits in same multi-conductor cable.
10. Clamp cable entering equipment with commercial type cable clamps.
11. Leave sufficient length cable ends to make connections conveniently to equipment, fixtures, and devices.
12. Provide 5-conductor cable for each three-phase current and each potential transformer circuit.
13. Retain sufficient length of conductors in a current transformer cable length to reach farthest terminal used to select current transformer ratios.
14. Retain spare single conductors at each end of a multi-conductor cable in a length equal to longest single conductor of multi-conductor cable.
15. Terminate spare conductors of multi-conductor cable at terminal blocks. Ground spare conductors by using wire jumpers between terminations and equipment ground bus.
16. Run both positive and negative leads of a direct-current circuit in same cable.

3.02 CABLE AND CONDUCTOR IDENTIFICATION

A. Cable and Conductor Markers:

1. Text to be machine or computer generated. Hand written text is not acceptable.
2. Print cable or conductor designations as shown on approved drawings.
3. Tag cables at each end.
1. Cable:
   a. Provide cable with cable marker. Print cable designation.
   b. Cable designation to be a single-line of text that includes cable number, originating equipment designation, and destination equipment designation. Develop cable designations when not shown. Examples of cable designations are:
      1) 1MCA-DV1 - First cable from motor control center MCA to discharge valve No. 1).
      2) 3MCB-ACP - Third cable from motor control center MCB to auxiliary control panel ACP.
   c. Attach tags to cable with self-locking tie wraps or cable ties.

2. Conductors:

   a. Provide individual conductors of multi-conductor control cable, instrumentation cable, and telecommunications cable with conductor marker. Print conductor designation, on first line. Print conductor destination and device terminal number on second line.

   b. A single line conductor marker will be acceptable provided the conductor designation is enclosed in parenthesis followed by the conductor destination.

   c. Provide markers for spare conductors of multi-conductor cables. The marker to include cable designation and the word "SPARE". Numerically sequence the spare conductor markers e.g. (1CSA-CSB-SPARE1, 2CSA-CSB-SPARE2, etc.).

3. Attach tags to cable with self-locking tie wraps or cable ties.

3.03 CONTRACTOR FIELD QUALITY TESTING

A. Perform testing after installation, but before connection to equipment.

B. Test cables in large groups to minimize number of testing sessions.

C. Notify COR, in writing, of date, time, and cables to be tested at least 5 working days before testing. Testing dates to be mutually agreeable between Contractor and COR.

D. Perform following tests:

1. Continuity test: Test continuity of each conductor prior to performing insulation resistance test.

2. Insulation resistance tests for power, control, and instrumentation cables:

   a. Measure insulation resistance between each conductor and station ground with all other conductors in same cable or conduit grounded.

   b. Test voltage: 1,000 volts direct-current, minimum.

   c. Minimum acceptable insulation resistance: R in MΩ (rated voltage in kV + 1) x 1000/length in ft.

3. Record following test data on test report for each conductor tested:

   a. Date of test.

   b. Name or names of Contractor's personnel who performed test.

   c. Name of Government inspector who witnessed test.

   d. Conductor identification.

   e. Megohms between conductor and ground.

   f. Total length of conductor.

E. Perform the following tests – Fiber Optic cable:

1. Test each fiber using an Optical Time Domain Reflectometer (OTDR):

a. Purpose and intent of testing:

1) Determine if installed cable is free from defects.

2) Compare measured attenuation with cable manufacturer's specified attenuation of 0.4 decibels per kilometer for 1300 nanometer light.

3) Compare measured bi-directional splice loss with specified splice loss of 0.1 decibels per splice.

4) Compare measured connector loss with specified connector loss of 0.5 decibels.

5) Verify cable length.

b. OTDR requirements:

1) Fiber type: Single-Mode.

2) Dynamic Range: 25 decibels, minimum.

3) Resolution: Selectable 0.1 to 10 meters.

4) Pulse width: Selectable. 1 for all tests.

5) Reflectance accuracy: plus or minus 2 decibels.

6) Loss accuracy (Linearity): 0.02 decibel per decibel.

c. Obtain an OTDR waveform for each fiber to:

1) Determine actual cable length.

2) Determine attenuation and splice loss.

3) Identify and locate splices and step discontinuities/possible fiber breaks.

d. Prepare test reports:

1) Generate a PDF copy and paper copy of each trace made during testing for inclusion in the report:

2) OTDR waveform for each fiber showing "A" and "B" range marks.

a) Do not move or change location of either mark.

3) Include an Analysis Summary Results Table for each fiber:

a) Indicate numerical values associated with each event.

b) Do not use question marks, dashes, or blanks.

4) Include following information for each trace:

a) Trace name.

b) Operator's name.

c) Date and time.

d) Fiber type being tested.

e) Bundle color.

f) Fiber color.

g) Fiber number.

h) Launch reel length.

i) OTDR resolution.

j) Pulse width.

k) Wavelength.

l) Index of refraction.

m) Averaging number.

n) Receiver bandwidth.

o) Sampling point count.

p) End to end loss, decibels.

q) Reflectance, decibels.

r) Fiber Break, decibels.

s) Backscatter.

5) Traces to be viewable and reproducible on a PC using Windows 10 or later.

F. Perform the following tests – CAT 6 cable:

1. Test equipment shall conform to TIA-1152.
2. Inspect network cabling terminations for T568A color configuration.
3. Perform testing for each outlet.
4. Performance test:
   a. Perform Category 6 link tests in accordance with TIA-568-C.1 and TIA-568-C.2.
   b. Tests shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew.

G. If any cable or conductor fails testing, remove and replace cable.

END OF SECTION

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of grounding and bonding in the lump sum price offered in the Price Schedule for Complete Electrical System.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1.	ASTM B 3-2018	Soft or Annealed Copper Wire
2.	ASTM B 8-2017	Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft

B. Institute of Electrical and Electronic Engineers (IEEE)

1.	IEEE 81-2012	Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System
2.	IEEE 142-2007	Grounding of Industrial and Commercial Power Systems
3.	IEEE C2	National Electrical Safety Code (NESC)

C. National Electrical Testing Association (NETA)

1.	NETA ATS-2017	Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems

D. National Fire Protection Association (NFPA)

1.	NFPA 70-2026	National Electric Code (NEC)

E. Underwriters Laboratories (UL)

1.	UL 467-2013	Grounding and Bonding Equipment

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals and 01 33 26 - Electrical Drawings and Data.

B. RSN 26 05 26-1, Approval Data:

1. Manufacturer's technical catalog data.

C. RSN 26 05 26-2, As-Built Drawings:

1. Specifications drawings indicating as-built changes made to grounding systems.

D. RSN 26 05 26-3, Test Reports.

1.04 DESIGN REQUIREMENTS

A. Design and provide grounding system to provide grounding system for new components and where existing components grounding system or grounding connections are impacted.

B. Provide grounding in accordance with NFPA 70.

PART 2 PRODUCTS

2.01 MATERIALS

A. Ground Cable:

1. Annealed bare-copper cable:

a. ASTM B 8, class B.

b. Solid wires used in forming the copper cable: ASTM B 3.

2. Concentric stranded.

3. Sizes:

a. Minimum sizes:

1) Ground risers and electrode conductors: 4/0 AWG.

2) Equipment grounding conductors:

a) High Energy Equipment: Equal size to electrode conductors.

i. Includes equipment and components operating or connected at 480 volts and above.

ii. Includes switchgear, motor control centers, distribution transformers, generators, medium voltage motors, etc.

b) Low Energy Equipment: No. 4 AWG

c) Instrument cases: 12 AWG.

3) Equipment ground ring bus: Equal in size to largest riser.

4) Electrode interconnecting conductors: Equal in size to electrode conductors.

B. Ground Rods:

1. Type: Solid, copper-clad steel.

a. Bond 0.010 inch thick layer of copper inseparably to steel core.

2. Length: 10-feet.

3. Diameter: 3/4-inch, nominal.

4. In accordance with UL 467.

2.02 ACCESSORIES

A. Cable Connectors:

1. Welded, bolted solderless or compression type.

2. Current-carrying capacity: Equal to cable with which they are used.

3. Connectors for ground cables, including fittings, lugs, bolts, nuts, and washers: Copper alloy containing not more than 4 percent zinc.

4. Bolted solderless or compression type connectors: IEEE 837.

5. Ground connectors that will be direct buried or embedded in concrete: Listed for direct burial use in accordance with the requirements of UL 467.

B. Ground Plates:

1. Copper or copper-alloy.

2. Four-hole type, except where indicated on drawings.

C. Flexible Copper Braid:

1. Flat, extra flexible, tinned, pure copper braid.

2. Unplated, seamless, pure copper ferrules formed into a rectangular shape on each end.

3. Ampacity: Suitable for the application.

4. Overall length: Suitable for the application.

2.03 WELDING PROCESS

A. Use Cadweld, Thermoweld, or equivalent exothermic process.

B. Molds and weld metal:

1. Use fresh stock from same manufacturer.

2. Weld metal and starting material: No significant quantities of hazardous ingredients.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NFPA 70, IEEE C2, IEEE 142, and this Section.

B. Connect equipment, metal conduit, steel structures, metal pull box covers, exposed metal surfaces, enclosures, and other miscellaneous metalwork to grounding system as indicated on Standard Drawings 40-D-4334, 40-D-4335, and 40-D-4753.

C. Ground or bond as applicable:

1. Motors and generators.
2. Tanks.
3. Piping and metallic flume components.
4. Electrical equipment.
5. Metallic structural components.
6. Metallic enclosures for control and electrical equipment.
7. Instrumentation.
8. Electrical raceway.
9. Shielding and armor on insulating conductors.

D. Do not connect equipment grounding conductors directly to steel reinforcing bars.

E. Ground equipment and miscellaneous metalwork that is required to be grounded, but is not indicated on drawings to grounding system.

F. Ground all metallic raceway in accordance with the requirements of NFPA 70.

G. Ground all cable shielding in accordance with the manufacturer's recommendations, and Section 26 05 10 – Conductors and Cables.

H. Conduits may only be considered as a supplementary grounding connection. For conduits terminating at electrical equipment, bond the conduit to the equipment. For conduits terminating at cable trays, terminate with a grounding bushing and provide a ground cable connection between the bushing and the facility grounding system. Make conduit runs containing flexible conduit electrically continuous. Use flex connectors that provide electrical bonding between flex and rigid conduit for this purpose.

I. Ground risers.

1. Interconnect all grounding electrodes to ground rods.
2. Install ground riser at following locations
   a. Electrical service drop.
   b. One per slide gate.

J. Ground electrode interconnections:
1. Install minimum of two physically separate grounding electrode tie conductors as interconnections between ground electrodes of grounding system.
2. Installation depth: At least 2-1/2 feet.

K. Ground rods:
1. Drive ground rods vertically until tops of rods are within 2 inches above installation location of ground cables to which rods will be connected.
2. If solid rock is encountered within 3 feet of the subgrade, grout ground rod into 1-1/4 inch vertical hole such that top of rod is within 2 inches above installation location of ground cables to which rod will be connected.
3. If solid rock is encountered deeper than 3 feet below the subgrade, drive ground rod to refusal at approximately a 45 degree angle, then bend ground rod horizontally such that top of rod is within 2 inches above installation location of ground cables to which rod will be connected.

L. Connections:
1. Make all ground connections between equipment and miscellaneous metalwork, and ground plates of grounding system whether or not such grounding connections are indicated on drawings.
2. Number of grounding connections for equipment may be one, two, or more in some cases.
3. Remove paint, enamel, scale, oil, grease, or other foreign nonconductive material from point of contact on metal surfaces before making ground connections.
4. Repair damaged or removed paint or galvanizing material on metal finishes.
5. Make ground connections that will be direct buried or embedded in concrete:
   a. Exothermic process.
   b. In accordance with manufacturer's instructions.

M. Cable Trench Grounding:
1. In accordance with standard drawing 40-D-6182.
   a. Run two No. 2/0 AWG copper cables entire length of trench.

b. Connect No. 2/0 AWG trench cables to ground mat each time trench crossed a main ground mat copper cable.

3.02 CONTRACTOR FIELD QUALITY TESTING

A. Test resistance of grounding system:

1. Notify COR at least 24 hours in advance of time of test in order that test may be witnessed by COR.
2. Perform test within 30 days after completion of structural concrete work.
3. Perform inspection and testing recommended in NETA ATS.
4. Measured Resistance: Less than 5 ohm.
5. Use fall of potential method in accordance with IEEE 81.
6. Testing Device: Earth resistance tester.
   a. Heavy-duty, low-resistance type with direct-reading and direct-current ohmmeter.
   b. Capable of measuring ground resistance to an accuracy of 0.5 ohms or better.
7. Test Performance:
   a. Initial distance between remote current electrode (C) and grounding system under test (X): At least six times longest diagonal dimension of grounding system.
   b. Beginning at electrode X, drive potential-reference electrode (P) into ground at a number of test points on a straight line between electrode X and electrode C.
   c. Distance between test points: Approximately 5 percent of actual distance between electrodes X and C.
   d. Continuously log apparent resistance readings for each test point and plot curve of resistance versus distance to ensure that the electrode C location is giving acceptable results as indicated in IEEE 81.
   e. Measure and record test points until reaching electrode C or as determined by COR. If plot of resistance vs. distance curve indicates remote current electrode is in area of influence of grounding system, increase distance between electrode C and grounding system, and measure and record a new set of test data.

END OF SECTION

SECTION 26 05 33
RACEWAYS AND BOXES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of raceways and boxes in the lump sum price offered in the Price Schedule for Complete Electrical System.

1.02 REFERENCE STANDARDS

A. American National Standards Institute (ANSI)

1.	ANSI C80.1-2015	Electric Rigid Steel Conduit (ERSC)
2.	ANSI C80.6-2018	Electrical Intermediate Metal Conduit (EIMC)

A. National Electrical Manufacturers Association (NEMA)

3.	NEMA FB 1 - 2014	Fittings, Cast Metal Boxes, And Conduit Bodies For Conduit, Electrical Metallic Tubing And Cable
4.	NEMA RN 1-2018	PVC Externally-Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
5.	NEMA TC 2 - 2013	Electrical Polyvinyl Chloride (PVC) Conduit
6.	NEMA TC 3 - 2016	PVC Fittings for Use With Rigid PVC Conduit and Tubing.
7.	NEMA TC 7-2016	Smooth-Wall Coilable Polyethylene Electrical Plastic Conduit
8.	NEMA 250 – 2018	Enclosures for Electrical Equipment (1000 Volts Maximum)

B. National Fire Protection Association (NFPA)

1.	NFPA 70-2026	National Electrical Code (NEC)

C. Underwriters Laboratories (UL)

1.	UL 360-13	Liquid-Tight Flexible Metal Conduit

2. UL 651-11 Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals and 01 33 26 - Electrical Drawings and Data.

B. RSN 26 05 33-1, Approval Drawings and Data:

1. Manufacturer's catalog data for supplied components.
2. Shop drawings for fabrication of electrical vaults, including views showing each face of the vault and vault structural design information.

C. RSN 26 05 33-2, As-Built Drawings and Data:

1. As-built raceway and box location and route.

1.04 DESIGN REQUIREMENTS

A. Determine routing of conduit when not shown.

B. Determine size of junction, pull boxes and vaults, unless shown otherwise.

C. Determine size of wireways and wiring troughs in accordance to NFPA 70, unless shown otherwise.

D. Design raceway support systems.

1.05 QUALITY

A. In accordance with NFPA 70. Material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization in order to provide a basis for approval under NFPA 70.

B. Materials and Equipment manufactured within the scope of standards published by Underwriters Laboratories, Inc., shall conform to those standards and shall have an applied UL listing mark.

PART 2 PRODUCTS

2.01 CONDUIT

A. Rigid steel conduit and attached fittings:

1. Zinc-coated and in accordance with ANSI C 80.1.

B. Intermediate metal conduit and attached fittings:

1. Zinc-coated and in accordance with ANSI C80.6.

C. Plastic Conduit and Fittings:

1. Schedule 80 PVC.
2. Length: Manufacturer's standard 10- or 20-foot lengths.
3. Conduit conforms to NEMA TC 2, NFPA 70, and UL 651. Fittings and conduit bodies conform to NEMA TC 3, and NFPA 70.
4. Plastic conduit for outdoor use:
   a. Sunlight resistant.
   b. Temperature rating: Not less than 90 degrees C/194 degrees F.

D. Liquidtight Flexible Metal Conduit (LFMC):

1. Interlocked steel construction with flame-retardant PVC jacket.
2. Sunlight resistant.
3. Color: Black.
4. Conform to NFPA 70 and UL 360.
5. Fittings conform to NEMA FB 1.

E. Wireways: Lay-In NEMA Type 12 Wireway, manufactured by Hoffman Engineering Company, Anoka, Minnesota; or equal, with the following essential characteristics:

1. Material: Manufacturer's standard gauge steel.
2. Seam continuously welded and ground smooth.
3. Smooth, rounded edges on sections and fittings.
4. Hinged covers with quick-release latches and oil-resistant gasket.
5. Furnish without holes or knockouts. Punch holes onsite as required.
6. Finish: Manufacturer's standard grey coating.
7. Secure screw-type covers with rustproof screws.

F. Nonmetallic high-density polyethylene flexible (HDPE) conduit:

1. Prelubricated, extruded, flexible high-density polyethylene resin type.
2. Does not retain coiled shape when removed from roll.
3. Anneal during extension process.
4. Minimum bending radius of less than or equal to 14 times outside diameter of conduit.
5. Furnish with 3/8-inch woven tape pull member.
6. For use with power and multi-conductor control cables:

a. In accordance with NEMA TC 7.

b. Schedule 80.

G. Plastic-coated rigid steel conduit:

1. In accordance with rigid steel conduit specified above.

2. External PVC coating: In accordance with NEMA RN 1.

a. Apply equal bonded coating to elbows, fittings, couplings, hangers, and other accessories.

3. Sleeve fittings and couplings to provide watertight joint. Use solvent to make fittings and couplings watertight as recommended by manufacturer.

2.02 OUTLET BODIES, DEVICE BOXES, JUNCTION AND PULL BOXES

A. Outlet Bodies and Fittings:

1. Material: Cast iron or malleable iron.

2. Covers: Cast or sheet metal.

B. Cast Devices Boxes: Type FD and GRF manufactured by Cooper Crouse-Hinds; or equal, having the following essential characteristics:

1. Rectangular or round, deep-wiring device outlet boxes with threaded hub connections for rigid steel conduit.

2. Material: Iron alloy.

3. Number of gangs: As required.

4. Provide plugs for unused openings.

5. Extension rings: Iron alloy with corrosion-resistant finish.

C. Fabricated Sheet Steel Boxes:

1. Used as junction and pull boxes.

2. Sheet steel thickness: No. 14 United States Standard gauge, minimum.

3. Boxes installed outdoors to be NEMA type 4X.

4. Finish: Manufacturer's standard grey coating.

5. Attach covers with bronze, brass, or stainless steel screws or bolts.

6. Boxes exposed to weather:

a. Weather-resistant and watertight type.

b. Provide covers with oil-resistant gaskets.

7. Conform to NEMA 250.

D. Large, fabricated sheet steel, free standing Type 4 enclosures as manufactured by Hoffman Engineering Company, Anoka, Minnesota; or equal, with the following essential characteristics:

1. Large free standing pull box, NEMA 250, Type 4.
2. Sheet steel: 12 gauge, minimum.
3. Seams: Continuously welded and ground smooth.
4. Coating: Polyester powder coating over phosphatized surface, inside and out, ANSI grey.
5. Internal mounting channels welded horizontally to sides at top, bottom, and center.
6. Stainless steel door clamps and heavy gauge continuous hinge with stainless steel pin.
7. Includes lifting eyes, document pocket, and oil resistant door gasket.
8. Size in accordance with NFPA 70 or as indicated on drawings.

E. Concrete Cable Splice Boxes:

1. Pre-cast concrete type.
2. 3/8-inch welded rebar frame.
3. Exterior dimensions:
   a. Length: 40 1/8 inches.
   b. Width: 28 1/8 inches.
4. Equip box with bolt-down steel cover.

2.03 CONDUIT ACCESSORIES

A. General:

1. UL Listed.
2. Conform to NEMA FB 1 as applicable.
3. Steel materials and hardware: Galvanized.

B. Provide fittings required to complete electrical conduit systems. Includes, but not limited to, caps, connectors, couplings (excluding expansion and expansion-deflection couplings), nipples, reducers, elbows, pipe plugs, locknuts, bondnuts, bushings, seals (excluding wall penetration seals), and any other fittings.

C. Provide devices required to complete electrical conduit systems and to fasten, clamp, attach, and support each conduit in place.

1. Includes threaded joint compound; protective sealant; materials for sealing ends of conduits terminating at outdoor boxes, panelboards or cabinets; supports and clamps.
2. Complete with bolts, washers, and nuts.

D. Conduit Sealing Bushings:

1. Non-Toxic.
2. Non-shrinking.
3. Fire-retardant type.
4. Seals against liquid, gas, and vapor seepage.

E. Expansion-deflection Couplings:

1. Furnish for movement in any direction.
2. Watertight, raintight, and concretetight.
3. Deflection and expansion: 3/4-inch, minimum.
4. Angular misalignment: 30 degrees, minimum.

F. Expansion Couplings:

1. Furnish for longitudinal movement only.
2. Zinc coated, watertight type.
3. Capable of at least 4-inch expansion/contraction.
4. Expansion couplings for plastic conduit shall expand at least 4 inches for each 100 feet of run and for each 100 degrees F temperature change.

G. Protective Sealant:

1. Water repellant.
2. Resistant to peeling and cracking.

H. Sealing Materials:

1. General use:
   a. Non-toxic.
   b. Non-shrinking.
   c. Fire retardant type.
   d. Seal ends of conduit against liquid, gas, and vapor seepage.

I. Adhesive: In accordance with conduit manufacturer's recommendations.

J. Polyethylene warning tape.

1. Thickness: 6 mils.
2. Non-detectable.
3. Width: 6 inches, minimum.
4. Color: Red.
5. Copy: Continuously imprinted with "CAUTION BURIED ELECTRIC LINE BELOW".
6. Suitable for direct burial.

K. Corrosion Protection Tape:

1. Scotchrap TM 50 All-Weather Corrosion Protection Tape manufactured by 3M, St. Paul, Minnesota, or Plymouth Plywrap 11 Vinyl Pipe Wrap manufactured by Plymouth Rubber Company, Canton, Massachusetts; or equal, having the following essential characteristics:
   a. Thickness: 10 mils, minimum.
   b. Material: Polyvinyl Chloride (PVC)

L. Pull-Tape, -String, and -Rope:

1. Composition: Polyester.
2. Pulling Strength: 200 pounds, minimum.

M. Conduit Riser Grips:

1. Suitable to support vertical cable runs in rigid steel conduit.
2. Single weave, closed or split mesh type.
3. Mesh material: Tin-coated bronze strands.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with Section 26 05 02 – Basic Electrical Materials and Methods.

B. Layout and Procedures:

1. Determine routing of exposed conduit when not indicated on drawings.
2. Determine exact locations of embedded conduit stub-ups based on equipment being furnished.
3. Ensure that conduit runs and bends are free from kinks, indentations, or flattened surfaces.

4. Stub conduit that terminates at horizontal surfaces 2 inches above finished floor level and terminate with coupling and plug. Replace plug with bushing or Chase-type nipple before installing insulated conductors.

C. Preparation:

1. Remove burrs and sharp corners at ends of metal conduit.
2. Coat male threads of rigid metal conduit joints with suitable graphite or zinc sealing material before making joints.

D. Install conduit with necessary fittings and supports.

1. Support conduit as indicated on Standard Drawing 40-D-7094.
2. Tighten conduit joints securely to ensure electrical continuity and to prevent entrance of moisture or foreign material.
3. Provide bushings or Chase-type nipples on ends of conduit to protect insulated conductors from abrasion.
4. Use locknuts and bondnuts to provide tight ground connections between conduit and boxes, panelboards, and cabinets.
5. Tighten conduit to electrical equipment mounted on tubular metal structures securely and support rigidly in place by conduit clamps, hex head nuts, and threaded 3/8-inch stud fasteners driven by powder-actuated tools.

E. Bends:

1. Install smooth, gradual bends to permit pulling insulated conductors without undue stress or damage to conductors or conduit.
2. Bend conduit cold to prevent damage to protective coating.

F. Brick masonry walls: Route conduit through centerlines of grouted portions.

G. Direct buried conduit:

1. Use plastic conduit.
2. Make transitions from PVC conduit to metal conduit in the horizontal run of buried conduit. Use suitable transition fittings designed for the application.
3. Provide pull-tape, string, or rope in empty conduits.
4. Depth, minimum: 24 inches.
5. Install 2 inches of sand around each conduit.
6. Backfill and compact in accordance with Section 31 23 11 – Earthwork for Pipe and Structures.
7. Install a continuous strip of Polyethylene warning tape located approximately 12 inches above direct buried conduit or ductbanks.

8. Reference drawing 40-D-6576.

H. Embedded conduit (in concrete):

1. Rigid steel type, unless indicated otherwise.
2. Conduit for motor neutral grounding leads: Nonmetallic type.
3. Hold conduit, conduit fittings, and conduit boxes securely in position while concrete is being placed.
4. Protect ends of conduit to prevent entrance of concrete, sand, or other foreign material.
5. Terminate ends of conduit that do not terminate at boxes with couplings and pipe plugs or insulating bushings and caps.
6. Clean concrete from inside of conduit boxes immediately after forms are removed.
7. Clean threads for attaching devices and covers to boxes.
8. Swab conduit within 24-hours after removal of forms with clean dry rags until conduit is thoroughly cleaned and dried.
9. Grease threads of removed plugs and reinstall plugs to prevent entrance of water or foreign material.
10. Seal conduit boxes with rubber gasketed blank cover.

I. Exposed conduit runs:

1. Intermediate metal conduit, unless shown otherwise.
2. Straight and parallel with each other and with centerlines of structure.
3. Support conduit rigidly from wall or ceiling within 3 feet of each outlet box, junction box, cabinet, or fitting; and at intervals of not more than 5 feet.
4. Installation includes, where required, drilling holes in bottom, side, or top of enclosures or plates of other electrical equipment.
5. Tighten conduit securely.
6. Support conduit rigidly in place.
7. Make connections to outdoor boxes watertight.

J. Expansion Couplings: Use where exposed or embedded conduits cross expansion or contraction joints. Install expansion couplings and expansion-deflection couplings in accordance with manufacturer's instructions.

K. Liquidtight Flexible Metal Conduit (LFMC):

1. Use for connections to motors and electrical equipment that is subject to movement, vibration, or misalignment; where flexibility is required; or where shown.
2. Maximum length of conduit section is not to exceed 6 feet. Lengths exceeding 6 feet require approval by COR.
3. Secure and support conduit sections in accordance with NFPA 70.

L. Plastic-Coated Rigid Steel (PCRS) Conduit:

1. Joints:
   a. Watertight.
   b. Coated or covered in accordance with manufacturer's instructions.
   c. Tighten securely with plumbers-type strap wrench.
   d. Repair or recover damaged portions of protective coat in accordance with manufacturer's instructions.
   e. Extend bonded covering at least 3 inches into concrete or above ground surface where buried conduit is connected to embedded conduit or is extended above ground.
   f. Use solvent when installing fittings and couplings to permanently bond sleeves to plastic coating of conduit.
2. Bend plastic-coated conduit in accordance with manufacturer's recommendations.
3. Use factory bends when manufacturer warns of possible damage to conduit or plastic coating when bending larger sizes.

M. Seals/Sealing:

1. Seal ends of conduits that terminate at boxes, panelboards, or cabinets with sealing material or sealing bushings to prevent air circulation through conduits into boxes, panelboards, or cabinets. Install seals in accordance with manufacturer's instructions.
2. Install conduit seals where conduits enter electrical enclosures in a Class I, Division 1 or 2 location; and where conduit runs pass from a Class I, Division 1 or 2 location into an unclassified location.
3. Furnish and install wall penetration seals for conduits entering structures below grade. Install seals in accordance with manufacturer's instructions.

N. Deflection/Expansion Fittings:

1. Provide where embedded conduit cross open joints. Install deflection/expansion fittings in accordance with manufacturer’s instructions and recommendations.

O. Conduit Tags:

1. Provide metal conduit tags for conduit terminations.
2. Stamp or engrave tag with conduit identification.
3. Permanently attach tag to conduit with wire and metal crimp-type connector.

END OF SECTION

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SECTION 26 05 80
WIRING CHECKOUT AND TESTS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of wiring checkout and tests in the lump sum price offered in the Price Schedule for Complete Electrical System.

1.02 REFERENCE STANDARDS

A. National Fire Protection Association (NFPA)

1. NFPA 70-2026 National Electrical Code (NEC)

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittals and Section 01 33 26 – Electrical Drawings and Data.

B. RSN 26 05 80-1, Test Reports.

1. See Article **Error! Reference source not found.**.

1.04 DEFINITIONS

A. External Wiring: Any conductor, wire, or cable that is external to the enclosure of the equipment being tested.

B. Internal Wiring: Any conductor, wire, or cable that is internal to the enclosure of the equipment being tested.

C. Qualified Person: In accordance with Article 100 of NFPA 70.

D. Wiring Checkout: A complete wire-by-wire, contact-by-contact, terminal-by-terminal inspection of wiring associated with a specific piece of equipment.

1.05 PERFORMANCE REQUIREMENTS

A. These tests are in addition to tests required by Section 26 05 10 - Conductors and Cables.

B. Furnish materials, including test equipment, required for checkout and testing.

C. Make wiring changes and drawing revisions to ensure there are no discrepancies between check prints, and internal equipment wiring and external cabling.

D. Replace defective equipment and make device setting adjustments as required for operation of electrical systems in accordance with specifications and manufacturer's instructions.

E. If required during testing, remove and replace wire connections.

F. Make wiring changes, wire tag revisions, and other repairs or revisions during the testing session the discrepancy is discovered.

G. Perform wiring checkout, and operational and functional tests in presence of the COR.

1.06 QUALIFICATIONS

A. Testing Personnel:

1. Competent and qualified person to perform wiring checkout, and operational and functional testing.
2. Have thorough knowledge of the electrical equipment, installation, and drawings.
3. Qualified to operate equipment being tested.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Notify COR in writing 10 days in advance of each testing session.

B. Provide following at time wiring checkouts and tests are performed:

1. Two complete sets of full-size (ANSI D) electrical schematic and wiring diagram check prints for equipment being tested.
   a. One set to be used and maintained by the COR.
   b. One set to be maintained by Contractor and used to produce final drawings.
2. Operation and maintenance instruction books and test reports for equipment being tested.

C. Perform wiring checkout and tests in accordance with the following:

1. Wiring Checkout:

a. Use electrical schematic and wiring diagram check prints to perform internal wiring check of equipment.

b. Use electrical schematic and wiring diagram check prints to perform wiring check of external cabling.

c. Perform a complete wire-by-wire, contact-by-contact, terminal-by-terminal check of circuit logic.

d. Verify contact configuration and contact numbering.

e. Verify continuity of wiring.

f. Verify proper wire tagging at ends of conductors and cables.

g. Check conductors for insulation damage. Perform additional insulation resistance test of damaged conductors.

2. Operational and Functional Testing:

a. Perform after completion of wiring checkout of equipment being tested.

b. If required, adjust and calibrate protective devices in accordance with specifications, and manufacturer's instructions and recommendations.

c. Check electrical systems and controls for proper sequence of operation, correct adjustments and settings, and agreement with schematic diagram.

3.02 FIELD TEST REPORTS

A. Provide a letter stating all wiring has been checked and tested by the contractor and witnessed by the COR. A signature from the COR is required on this letter.

END OF SECTION

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SECTION 26 24 20
CONTROL BOARDS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of control boards in lump sum price offered in the Price Schedule for Complete Electrical System.

1.02 ACRONYMS

A. ASCII: American Stand Code for Information Interchange.

B. DNP: Distributed Network Protocol.

C. HART: Highway Addressable Remote Transducer.

D. I/O: Input/Output.

E. OIT: Operator Interface Terminal.

F. PAC: Programmable Automation Controller.

G. PID: Proportional-integral-derivative.

H. PLC: Programmable Logic Controller.

I. RAM: Random Access Memory.

J. RTU: Remote Terminal Unit.

K. SAT: Site Acceptance Test.

L. TCP: Transmission Control Protocol.

1.03 REFERENCE STANDARDS

A. International Code Council (ICC)

1.	IBC-21	International Building Code

B. International Electrotechnical Commission (IEC)

1.	IEC 61131-3 2025	Programmable Controllers – Part 3: Programming Languages

C. National Electrical Manufacturer's Association (NEMA)

1.	NEMA 250-2020	Enclosures for Electrical Equipment (1000 Volts Maximum)
2.	NEMA BI 50009-2024	Low Voltage Cartridge Fuses
3.	NEMA ICS 1-2022	Industrial Control and Systems: General Requirements
4.	NEMA ICS 2-2000 (R 2005, R2020)	Industrial Control and Systems: Controllers, Contactors and Overload Relays, Rated 600 Volts
5.	NEMA ICS 5-2017	Industrial Control and Systems: Control Circuit and Pilot Devices
6.	NEMA IA 10030-2024	Industrial Control and Systems: Enclosures
7.	NEMA BS 31047-2013 (R2023)	Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum)
8.	NEMA WC 70-2021	Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy

D. National Fire Protection Association (NFPA)

1.	NFPA 70-2026	National Electric Code (NEC)
2.	NFPA 780-2026	Standard for the Installation of Lightning Protection Systems

1.04 SYSTEM DESCRIPTION

A. All electrical panels, control panels, enclosures, cabinets, etc., supplied by Contractor.

B. Provide electrical control for knife gate valve specified in Section 35 22 14 – Valves and Equipment and instrumentation from ultrasonic flowmeter specified in Section 33 09 12 – Ultrasonic Flowmeter System with the following features:

1. PLC-based control panel that receives valve positions from knife gate vault and pipe flow instrumentation signals from flowmeter vault; transmits this data to the Leavenworth National Fish Hatchery main facility; and accepts flow setpoints from knife gate vault and from the main Hatchery facility.

    a. Acceptable communication protocols between PLC, radio and devices are described in drawing 222-D-60369.

    b. Contractor-supplied system shall NOT require hard-wired interface for controls.

    c. OIT at knife gate vault shall accept operator OPEN, CLOSE and STOP commands for knife gate valve in MANUAL control mode.

d. OIT at knife gate vault shall indicate valve position (percentage open) and display real-time pipe flow rate.

e. OIT at knife gate vault shall accept operator flow setpoints during AUTO control mode.

f. OIT at main Hatchery facility shall display same data and accept same flow setpoints as OIT at knife gate vault. Synchronize data and setpoint across both OITs.

g. PLC shall control knife gate valve motor operators in AUTO and MANUAL control modes:

1) During AUTO control mode, PLC shall automatically and continuously modulate the knife gate valve to achieve the flow setpoint input by operator.

a) Establish control loop between flowmeter reading, valve position control, and flow setpoint.

b) Avoid control seeking or hunting to prevent motor degradation. Utilize appropriate PID controller tuning to avoid hunting.

2) During MANUAL control mode, PLC shall electrically operate valve based on operator input of OPEN, CLOSE and STOP commands.

h. During OFF mode, PLC shall not control valve electrically.

C. Provide power distribution system to all contractor-provided components and equipment for a complete and functional electrical system.

1. Feed 120 V electrical system from subpanel of EP 6 as shown in Figure 26 24 20 A, or alternate feed location as approved by COR.

2. Distribute 120 V to valve and flowmeter vaults and all contractor-provided equipment as shown on drawing 222-D-60370.

3. Re-use existing 480 V electrical power at existing isolation valve structure for permanent power to Contractor-supplied knife gate valve motor.

a. Refer to Section 02 41 10 – Selective Site Demolition.

4. Provide device overcurrent protection as described in drawing 222-D-60370.

5. In accordance with NFPA 70.

Figure 26 24 20 A- Subpanel feed from panelboard EP6.

D. Ground and bond all electrical systems in accordance with Section 26 05 26 - Grounding and Bonding.

1.05 DESIGN REQUIREMENTS

A. Provide latest hardware offered by respective manufacturers at time of award.

B. Utilize off the shelf system components and software packages.

C. Programmable controllers, I/O cards, communication cards, and back planes supplied by Contractor shall be same manufacturer. Minimize number of different types and models utilized.

D. Design layout of control board in accordance with NEMA ICS and NFPA 70, including:

1. Provide OIT for pipe flow rate instrumentation, valve positions, valve control, and flow rate setpoint.
2. Operator flow setpoints shall control positioning of knife gate valve to achieve desired combined pipe flow rate.

3. Control interface at main Hatchery facility shall be integrated with existing alarm radio system. Provide all programming labor necessary for a complete and functional control system. Control interface may be provided in software, hardware, or combination.

E. Furnish and install a new point-to-point Ultra-High Frequency (UHF) radio link and antenna at knife gate vault to permit two-way radio communication with existing radio system at main Hatchery facility.

1. Utilize government-provided radio spectrum for communication.
   a. Include licenses for all equipment, where required, as well as for any software or system hardware.
   b. Radios shall be Federal Communications Commission (FCC) compliant for use in the United States. Path designs with non-licensed radios will not be accepted.
2. Provide support tower for antenna.
3. Any antenna mounted to building exterior must be approved by local State Historic Preservation Office and COR.
4. Abide by Government restrictions for maximum transmitted power in frequency range.
5. Perform communication system study including radio path study and link budget calculations to determine radio system components and location necessary to establish communication link with existing radio system.
   a. Determine radio system components, quantity, and location requirements.
   b. Identify required antenna height.
   c. Identify required antenna gain.
   d. Provide link availability of a minimum of 99.7 percent.
   e. Effective Isotropic Radiated Power (EIRP) shall not exceed maximum allowed for service band.
6. If existing radio system is encrypted, then encrypt all communication prior to transmission through radio channel. Encryption protocol shall be compatible with existing data-logging/alarm computer and PLC system at main Hatchery facility.
7. Provide surge suppression to protect components against lighting strikes or other transient voltage surges.
   a. Install a lightning rod at the highest point of the structure, extending at least 10 inches above the antenna.
   b. Conform to NFPA 780.
8. Provide 120VAC to 120VAC isolating power supplies for all control equipment to stabilize and filter AC power.

1.06 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals and Section 01 33 26 - Electrical Drawings and Data.

B. RSN 26 24 20-1, Approval Drawings and Data:

1. Manufacturer's Technical Data.
2. Schematic diagram, wiring diagram, equipment layout, nameplate list, and bill of materials.
3. Communication system study report detailing radio system components, quantity, antenna location, and antenna height/gain/transmit power.

C. RSN 26 24 20-2, Check Prints.

D. RSN 26 24 20-3, Factory Test Report.

E. RSN 26 24 20-4, Final Drawings:

1. Schematic and wiring diagram drawings.

F. RSN 26 24 20-5, Site Acceptance Testing Reports.

G. RSN 26 24 20-6, Operation and Maintenance Instruction Book.

1.07 EXTRA MATERIALS

A. Furnish a set of special tools and accessories required for installation, normal operation, and maintenance. Include:

1. Contractor and manufacturer recommended tools and accessories.
2. Tools and accessories recommended for field maintenance and those designed to aid in diagnosis, maintenance, repair and replacement of supplied equipment.

B. Furnish following extra materials:

1. UHF Radio System Components: 1 of each type used, excluding structural or support components.
2. One contactor of each size and type used.
3. Six fuses of each size and type used.
4. Contractor or manufacturer recommended spare parts.
5. Replace spare parts used during installation, testing, and commissioning process to provide complete set of spare parts.

C. Where Contractor has performed programming or supplied software for the supplied components furnish two copies of system software. Include:

1. Software required to re-install software required for the system to function properly.
2. Copies supplied shall contain the final version of all furnished software.
3. Operating system software, where applicable.
4. Database and application software, where applicable.
5. Licensing in the Government's name for all software.
6. Provide a complete restorable external backup of every software component.

PART 2 PRODUCTS

2.01 ENCLOSURE

A. Location: above ground near knife gate valve vault.

B. Type 4X in accordance with NEMA 250.

C. Constructed from sheet steel no lighter than 12 MSG (Manufacturer's Standard Gage).

D. Tamper resistant.

E. Seams continuously welded and ground smooth.

F. Continuous door hinge.

G. Oil-resistant gasket attached with oil-resistant adhesive and held in place with steel retaining strips.

H. Equip enclosure door with flush lock and two keys.

I. Floor-mountable with provided supports.

J. Furnish with swing panel.

K. Nameplate:

1. Conform to Standard Drawing No. 40-D-6234.
2. Engraving: As indicated on drawings.
3. Attach nameplate to control board enclosure with machine screws. Use of adhesives for attaching nameplates is not acceptable.

L. Provide 120 V AC LED light fixture sufficient to illuminate panel interior for each enclosure.

M. Provide thermostatically controlled cabinet space heaters to control condensation in all cabinets not in a temperature-controlled environment, or subject to condensation.

N. Enclosure design shall allow free and easy access to internal components.

O. Where required enclosures shall have louvers, or ventilation, as required to maintain temperature of equipment within manufacturer recommended range. Interior temperature shall be maintained a minimum of 10 degrees F below maximum operating temperature of internal devices at maximum ambient temperature:

1. Louvers and openings shall be equipped with screens and changeable filter material to prevent the entrance of dust, insects and rodents.

P. All new enclosures shall include a minimum of 25 percent spare space.

2.02 PLC

A. Provide PLC as required by Section 25 12 10 – Programmable Logic Controller.

2.03 CONTROL DEVICES

A. Auxiliary Relays

1. Type: Self-resetting, heavy-duty, machine-tool. General purpose relays will not be accepted.
2. Contacts: Convertible with NEMA ICS 5 A600 rating.
3. Furnish two spare contacts on each relay, minimum.
4. Conform to NEMA ICS.

B. Transient Protection Units

1. Voltage protection level: 40 volts, peak.
2. Peak Power Dissipation: 45,000 watts.
3. Thermal and short circuit protection.
4. LED status indication.

2.04 WIRING DEVICES

A. Ground Bus

1. Copper.
2. Length: Width of enclosure.
3. Install at bottom of enclosure.
4. Bond mechanically and electrically to enclosure.

5. Drill and tap every inch for 10-32 screws. Install a 10-32 screw in each tapped hole.

B. Terminal Blocks

1. 600 volts and 25 amperes.
2. Suitable for use with 8 AWG wire.
3. Molded-block type to accommodate ring connectors 1/2 inch wide (outer diameter) at terminal screws.
4. Binding-head or washer-head screws having serrated or grooved contact surfaces or having lockwashers.
5. Molded insulating barriers between terminals.
6. Removable marking strips. Provide marking strips for terminal blocks with conductor designations engraved or printed with a permanent marking fluid. Furnish one spare blank marking strip with each terminal block.
7. Furnish and install heavy-duty terminal blocks with barriers for external supply cables.
8. Arrange and locate terminal blocks to support incoming and outgoing cables.
9. Separate adjacent rows of terminal blocks at least 6 inches edge to edge and at least 6 inches from sides, top, or bottom of the cabinet.
10. Install grommets at holes for wires and cables.
11. Furnish sufficient terminal blocks to wire and make ready for operation all equipment on boards, and to terminate incoming control and power cables.
12. Provide 25 percent spare terminals on each terminal block.
13. Mounting: Near bottom of boards for bottom entry, and near top for top entry.

C. Conductor Identifying Markers

1. Tag conductors near each terminal to identify them with their respective studs or terminals.
2. Vinyl-cloth with silicone plastic overcoating.

2.05 COMMUNICATION ANTENNA

A. Gain: As required.

B. Designed for all-weather applications.

C. Elevated with mast/facility structure support or communication tower.

D. Provide with all mounting hardware required to install on support structure.

2.06 COMMUNICATION TOWER

A. Type: Tri-lattice free standing or steel monopole.

B. Height: As required.

C. Perform design of communication tower in accordance with the IBC. If tower is interfacing or connecting to components of other structures, include evaluation of those structures and interface points in the communication tower design.

D. Placement away from powerlines for safety and interference.

2.07 OPERATOR INTERFACE TERMINAL (OIT)

A. Touchscreens with user interface displays.

B. Graphic Displays:

1. Support types of tasks and activities required of operator.
2. Separate graphic display screens shall be designed and provided for screens with different functions and locations.
3. Display names and designations for each piece of equipment supplied by Contractor, on graphics.
4. Use consistent design philosophy across graphic displays, however specific functions desired for individual screens may require unique arrangements of graphics and information.
5. User interaction techniques shall be developed in accordance with the following guidelines:
   a. Clear, with graphics consistent in method they present similar information.
   b. Graphic functions: Standardized, intuitive, straight forward with minimal user manipulation.
6. Provide feedback on completion of an action and/or of failure to complete an action.
7. Component Depiction:
   a. Utilize standard shapes for components. Shapes should be simple and avoid unnecessary detail.
   b. Show status of components clearly and consistently.
8. Alarms and indications of abnormal situations shall be clear, prominent, and consistently distinguishable.

2.08 RADIO MODEM

A. Model: NEXEDGE NXR-1800E2, as manufactured by JVCKENWOOD USA Corporation, PO Box 22745-4001 Worsham Avenue, Long Beach, CA 90808; or equal, having the following essential characteristics:

1. Frequency Band: 403-419 MHz
2. Bandwidth: 12.5 kHz
3. Operating Temperature: -30° C to 60° C (-22° F to 140° F)
4. Transmission Power: As determined from radio study.
5. Interface: Serial

2.09 ACCESSORIES

A. Provide one complete set of:

1. All necessary interfaces, connectors, connecting cables and accessories required for satisfactory and convenient operation of the equipment. Types of connectors, adapters to be used, and accessories of the approved quality shall be clearly indicated in the operation and maintenance manual.
2. Software and the arrangement to load the software onsite.

B. Special tools, extender boards, extender cables and accessories essential for installation, operation and maintenance of the equipment shall be provided.

2.10 FINISHES

A. Control Board Enclosure: Manufacturer's standard finish.

2.11 CONTRACTOR SOURCE QUALITY TESTING

A. Test at factory for correct operation and mechanical adjustment.

2.12 SOURCE QUALITY ASSURANCE

A. Government will inspect control boards prior to shipment to site.

1. Notify Government inspector at least 14 days in advance of inspection date.

PART 3 EXECUTION

3.01 INSTALLATION

A. As indicated on drawings.

B. Mount control boards such that any device that needs access is no higher than 78-inches above floor.

C. Mount OIT onto swing panel.

D. Provide anchoring and mounting materials required to install antenna tower.

E. Provide cable and wiring in accordance with Section 26 05 10 – Conductors and Cables and Section 26 05 02 – Basic Electrical Materials and Methods.

3.02 SITE ACCEPTANCE TEST

A. SAT shall be conducted to demonstrate the functionality, performance, and stability of the hardware and software, and to verify that hardware and software meet the requirements of the specifications and drawings.

B. Government reserves the right to request additional simulation and control algorithm tests, to demonstrate proper programming sequences.

1. Government reserves the right to witness Site Acceptance Test. COR shall be notified in writing at least 60 days prior to beginning the Site Acceptance Test.

C. Contractor shall provide a field service engineer familiar with the installed system to perform Site Acceptance Test.

D. Perform proper configuration and turning of electric motor actuator controllers, programmable logic controllers and network components to ensure requirements are met and facility personnel is well prepared for operation and maintenance.

E. Site Acceptance Tests shall be conducted in accordance with requirements listed in Section 26 05 10 – Conductors and Cables and 26 05 80 – Wiring Checkout and Tests, in addition to the following:

1. Inspection of equipment to verify equipment is not damaged and is properly installed.

2. While performing testing, remove and replace wiring connections that may be required in processing of checkout; and make wiring changes, setting adjustments, equipment replacements, or other revisions which are necessary for proper functioning of installation.

3. Verify all validated software and hardware updates and patches are installed prior to start of functional testing.

4. Perform 100 percent I/O and wiring checkout, closed loop simulation of binary/modulating logic, and validations of all logic and displays.

5. Controllers and PLCs shall be verified for the following:

a. Steady-state errors minimized for set points.

b. Responds with appropriate timing to disturbances.

c. Remains stable under all operating conditions.

6. Proportional, PI and PID controller tuning parameters shall be verified using ultimate oscillation or first-order-plus-dead-time.

7. Verify display of all alarms and warnings on the OIT, and associated designations in logs and reports for each I/O point.

8. Verify operation of communication between PLC, sensing and metering equipment, and Main Facility control network.

9. Demonstration of functionality of all OIT display screens, on-screen controls, and data displays.

10. Demonstrate functionality of data logging.

11. Verify operation of valve motor OPEN, CLOSE, and STOP operations in both MANUAL and AUTOMATIC control modes.

12. Demonstrate full-cycle actuation of all valves for a minimum of one full open-full close cycle using the PLC.

13. Demonstration of function of valve setpoints and of ability to change setpoints from OIT and from remote interface at main Hatchery facility.

14. Contractor to provide Pre-Start Checkout Test Procedure and Test Results documentation.

F. Site Acceptance Test Reports:

1. Provided to the Government within 28 days of test completion.

2. List of all equipment tested and results of each test.

a. Include final calibrated engineering unit values and corresponding amperage for each endpoint of calibrated analog devices.

3. 4-inch by 6-inch or larger pictures provided clearly showing the following:

a. Front and side view clearly depicting the control panel label, lockable handle, and vents for each enclosure.

b. Front view of Control Enclosure Swing Panel clearly showing placement of OIT for control enclosure.

c. PLC and affiliated components within enclosure wiring to include legible wire labels for each enclosure.

d. For each enclosure, front view of Control Enclosure with Swing Panel opened clearly showing placement of components within Control Enclosure.

END OF SECTION

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DIVISIONS 27 AND 28 – NOT USED

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DIVISION 31 - EARTHWORK

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SECTION 31 02 10
WATER FOR DUST ABATEMENT

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in prices offered in the Price Schedule for other items of work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 APPLYING WATER FOR DUST ABATEMENT

A. Provide water in accordance with Section 01 51 00 - Temporary Utilities.

B. Provide means of conveying water to point of use and applying water.

C. Use pressure spray or distributor bar to apply water evenly.

D. Apply water for dust abatement as directed by the COR.

END OF SECTION

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SECTION 31 03 10

DIVERSION AND CARE OF WATER DURING CONSTRUCTION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Diversion and Care of Water During Construction:

1. Payment: Lump sum price offered in the Price Schedule.

1.02 REFERENCE STANDARDS

A. National Marine Fisheries Service (NMFS)

1. Anadromous Salmonid Passage Facility Design Manual https://www.fisheries.noaa.gov/resource/document/anadromous-salmonid-passage-facility-design-manual, Section 8.5.8

B. Washington Department of Fish and Wildlife (WDFW)

1. https://wdfw.wa.gov/species-habitats/at-risk/habitat-recovery/fish-passage/screens/regulations

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 31 03 10-1, Plan for Temporary Pumping:

1. Contractor shall submit a written plan detailing the methods, materials, personnel, and equipment used for temporary pumping from the Spillway Pool to the USFWS Hatchery Outside Screen Chamber.

   a. Submitted plan shall clearly describe all equipment, materials, personnel, and methods used for this temporary pumping, including back-up and contingency items as necessary.

   b. Include an anticipated schedule of work, clearly showing the outage period of the pipeline diversion to the Fish Hatchery.

   c. Clearly show how 20 cubic feet per second of water is screened, pumped, conveyed, and delivered to the USFWS Hatchery Outside Screen Chamber.

   d. Clearly list all items of work required to be completed before the temporary pumping pipeline can be put into service.

   e. Clearly list all items of work required to maintain temporary pumping pipeline in operational status during pumping period.

f. Clearly list all items of work required to be completed before the existing concrete cylinder pipe (CCP) pipeline can be returned to service.

1) Include a statement that equipment and materials will be removed from the project site at the end of the Low-Flow Work Period.

g. Include a statement that plan is consistent with project conditions identified in this section.

1.04 PROJECT CONDITIONS

A. Temporary Pumping System Requirements:

1. Present flow though the existing CCP pipeline for hatchery operation from the surface water diversion, shall be maintained at all times, except during the Low-Flow Work Period as described in Section 01 14 12 – Work Restrictions.

a. Additional flow outage shall require the prior written approval of the COR, and of appropriate Federal and State water quality control agencies.

2. Temporary pumping system shall meet the more stringent of requirements as defined by either National Marine Fishery Service (NMFS) Northwest Region or Washington Department of Fish and Wildlife criteria for anadromous fry-sized salmonids.

a. System shall be maintained throughout entire temporary pumping period to meet these requirements. Include redundancies and conduct repairs, as necessary, to maintain requirements.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Pump Units:

1. Capable of delivering 20 cubic feet per second of water.

2. Includes:

a. Back-up pump on-site.

b. Power generator for continuous operation with backup option.

1) Secondary containment requirement for pumps due to proximity to live water.

B. Digital Flowmeter:

1. Calibration within 6 months of pump start-up.

2. Capable of continuous, online, reporting with a 48-hour data log.

a. Back-up of manually supported data logs of 5 days.

3. Tolerance: Capable of measuring flows within 3-percent of target flow.

C. Pump Screens:

1. Screening units shall comply with National Marine Fishery Service (NMFS) Northwest Region and Washington Department of Fish and Wildlife criteria for anadromous fry-sized salmonids.

   a. All welds and metal edges shall be ground smooth to remove burrs, and sharp and rough edges.

      1) Fish screen units shall be the rotating, retractable and removable, self-cleaning with external brushes and internal brushes (or equivalent cleaning mechanism), stainless steel cylindrical vee, wedge, or profile wire type screens.

      2) Fish screens shall be designed for installation at a water depth up to 20 feet and to withstand a pressure differential of 5 feet of head across the screen without exceeding allowable stresses or undergoing excessive deformation.

         a) Each fish screen system shall consist of a cylindrical fish screen, a set of fish screen retrieval tracks, a hydraulically or electrically operated retrieval mechanism, and a hydraulically or electrically operated rotating mechanism.

      3) Screen cleaning controls: Automatic, adjustable start/stop, and continuous.

      4) A hydraulic power unit (HPU) or electric motor shall be provided to power the forward/reverse rotation of each screen unit to facilitate cleaning of the screens.

      5) A hydraulic power unit (HPU) or electric motor shall provide power for the retrieval mechanism.

2. Temporary pumping units must be fully screened, no unscreened water shall be capable of entering the system.

3. Screens shall be maintained in working order throughout the entire temporary pumping period to meet these requirements. Conduct repairs, as necessary, to maintain requirements.

D. Pipeline:

1. Fabricated from commonly used materials in the industry.

2. Capable of conveying required flow in a single pipe.

3. System shall be sized to minimize pumping requirements and sediment transport to the USFWS Hatchery Outside Screen Chamber.

4. Temporary piping shall be safely supported and anchored in accordance with Section 01 35 20 – Safety and Health.

PART 3 EXECUTION

3.01 TEMPORARY PUMPING

A. Construct and maintain temporary pumping system to maintain continuous flow in accordance with approved plan.

B. Contractor shall notify COR and USFWS personnel at least 7 days prior to implementation of, changes to, and removal of temporary pumping system.

C. Contractor shall demonstrate temporary pumping system is operational and delivering a minimum of 20 cubic feet per second to the USFWS Hatchery Outside Screen Chamber at least 7 days prior to full reliance on the temporary system.

D. Temporary pumping pipeline route shall be in accordance with drawings, unless otherwise approved by COR.

1. Maintain vehicular access to spillway pool in accordance with Section 01 14 12 – Work Restrictions.

E. Motors and pumps shall be operated continuously through the Low-Flow Work Period. Back-up equipment shall be used to maintain continuous operation.

1. If back-up equipment becomes necessary, immediately notify COR.

3.02 PUMP SCREENS

A. Temporary pump screen units shall be lowered into the spillway pool using land-based equipment.

B. Temporary pump screen units shall be placed on existing riprap and streambed material. Existing surface cannot be modified to accommodate the temporary pump screen units.

C. Shall be installed, operated, and maintained in accordance with manufacturer's recommendations.

D. Shall be operated to meet the more stringent of requirements by either National Marine Fishery Service (NMFS) Northwest Region or Washington Department of Fish and Wildlife criteria.

3.03 CLEANUP AND REMOVAL

A. Remove all features of temporary pumping system at the end of the Low-Flow Work Period.

1. If multiple Low-Flow Work Periods require temporary pumping, equipment shall be removed from site in accordance with Section 01 14 12 – Work Restrictions.

B. Dispose of removed material in accordance with Section 01 74 00 – Cleaning and Waste Management.

END OF SECTION

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SECTION 31 03 33
REMOVAL AND CONTROL OF WATER

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include in applicable prices offered in the Price Schedule for items of work requiring removal of water from excavations.

1.02 DEFINITIONS

A. Dewatering: Removal and control of groundwater from pores or other open spaces in soil or rock formations to allow construction activities to proceed as intended and includes relief of groundwater pressure. Includes control and discharge of effluent waters.

B. Unwatering: Control and removal of ponded, seeping, or flowing surface water and from precipitation within and adjacent to excavations, intakes, and construction zones using channels, ditches, gravel drains, gravel blankets, pipe, sumps and discharge lines. Includes control and discharge of effluent waters.

1.03 SYSTEM DESCRIPTION

A. Design, install, operate, maintain and monitor water removal facilities.

B. Design and layout facilities to collect discharge water from water removal systems and convey water to designated approved discharge points as approved by the COR.

C. Locate water removal facilities to maximize water removal and minimize construction interference.

D. Select pump types and design discharge systems and settling ponds.

E. Provide required equipment and monitor as required by permit.

1.04 SUBMITTALS

A. Submit in accordance with Section 01 33 00 - Submittals.

B. RSN 31 03 33-1, Removal and Control of Water Plan:

1. Show proposed method for removal of water from excavations or foundations and associated discharge point in accordance with Section 01 57 30 - Water Pollution Control.

2. For payment purposes, prepare the plan with not more than three major divisions.

3. The plan may be placed in operation upon approval, but nothing in this paragraph shall relieve the Contractor from full responsibility for the adequacy of the water removal installation.

1.05 REGULATORY REQUIREMENTS

A. Obtain required Federal, State, and local permits for water discharge and other activities associated with removal and control of water.

B. Refer to Section 01 57 30 - Water Pollution Control.

1.06 PROJECT CONDITIONS

A. Conditions which may influence the unwatering include:

1. Frequency and rate of precipitation at the site.
2. Subsurface conditions including natural layering, thickness, permeability, storativity of materials, and groundwater levels.
3. Efficiency of pumps, collectors, and discharge systems.
4. Proximity to Icicle Creek.

B. Water content and water levels in subsurface materials within the basin vary with location, depth and material.

C. Refer to Section 53 10 00 – Geologic Investigations.

D. Refer to Section 53 20 00 - Records of Geologic and Subsurface Investigations.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 REMOVAL OF WATER

A. Provide, maintain, and operate necessary facilities for removal of water from various parts of the work and for maintaining foundations and other parts of the work free from water as required for constructing each part.

3.02 UNWATERING

A. Use ditches or sumps to lower and control water levels in advance of excavation.

B. Construct ditches and sumps to collect seepage and runoff in work areas. Ditches and sumps may not be excavated outside of the approved Contractor Use Areas, unless such work has been approved prior to construction by the COR. Use sandbags, sand and gravel filter bedding, and other materials and techniques to control localized seepage.

C. Maintain this water level until structures and/or backfill have been placed, subject to approval of COR.

3.03 DEWATERING

A. Dewater to prevent loss of fines from foundation, maintain stability of excavated slopes and bottoms of excavations, and to result in construction operations being performed in the dry.

B. Accomplish dewatering by use of sufficient number of properly screened well or other equivalent methods.

END OF SECTION

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SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Clearing and Grubbing:

1. Measure: Area cleared measured to dimensions shown on drawings for HDPE Pressure Pipe installation, or as determined by COR.
2. Payment: Unit price per acre offered in the Price Schedule.
   a. Includes:
      1) Clearing and grubbing.
      2) Provide construction staging area.
      3) Tree removal.
         a) See 01 14 12 – Work Restrictions, paragraph 1.04 N.
   b. Includes costs of disposing of cleared and grubbed material.

1.02 DEFINITIONS

A. Vegetation: Trees, shrubs, brush, stumps, exposed roots, down timber, branches, grass, and weeds.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CLEARING

A. Clear rights-of-way to be occupied by permanent construction and rights-of-way required for access to the work, utility service providers, and surfaces of borrow areas, stockpile sites, and wastepile sites.

B. Clear adjacent to cut or fill sections to a minimum distance of 3 feet outside of slope lines.

C. Remove vegetation, rubbish, and objectionable material as determined by COR.

D. Preserve and protect vegetation designated for preservation within clearing limits and vegetation outside clearing limits in accordance with Section 01 57 50 - Tree and Plant Protection and Section 01 14 12 – Work Restrictions, paragraph 1.04 O.

3.02 GRUBBING

A. Grub ground surfaces to be under compacted backfill and surfaces of excavation to be used for compacted backfill.

B. Remove stumps, and roots.

C. Perform grubbing in advance of grading operations.

3.03 DISPOSAL OF CLEARED MATERIAL

A. Dispose of material in accordance with Section 01 74 00 - Cleaning and Waste Management.

END OF SECTION

SECTION 31 14 10
STRIPPING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Stripping:

1. Measurement: Area measured to dimensions shown on drawings or as determined by COR.
2. Payment: Unit price per square yard offered in the Price Schedule.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 GENERAL

A. Strip portions inside extents of excavation, as shown on drawings, required for construction.

3.02 STRIPPING

A. Strip topsoil from areas to be excavated.

B. Remove topsoil to a depth of 6-inches and to additional depths where determined by COR:

1. If a true topsoil layer does not exist, consider the top 6-inches of surface soils removed to be topsoil for the purpose of this section.
2. If surface is rock, asphalt, or gravel, stripping not required.

3.03 STOCKPILING

A. Transport and stockpile topsoil as necessary prior to final hauling and placing.

B. Do not compact, drive on, place equipment on, or otherwise disturb topsoil in stockpile.

C. Protect stockpile from contamination and erosion. Stockpile topsoil separately from other excavated materials to prevent topsoil from mixing during construction and reclamation activities.

D. When topsoil is prolonged storage in stockpiles, cover stockpiles with tarp and secure tarp to stockpiles, as approved by COR.

3.04 PLACEMENT

A. Do not use topsoil removed by stripping for backfill, except as required below.

1. Transport and place topsoil to cover excavated areas that are to be seeded to a depth of 6 inches.
2. Spread remaining topsoil over borrow areas, disposal areas, and disturbed construction areas as determined by COR.
    a. Topsoil from other locations may be stockpiled within the Contractor Use Areas, unless approved by COR.

B. Remove trash, weeds, stones larger than 3-inches, and large pieces of vegetative materials:

1. Tree removal in accordance with Section 31 11 00 – Clearing and Grubbing.

C. Place topsoil to a minimum thickness of 6-inches.

D. Limit equipment travel over topsoil to avoid compaction.

E. Place topsoil as soon as practical after pipe trench backfill is completed.

F. Waste excess topsoil in accordance with Section 31 23 39 - Disposal of Excavated Materials.

G. Revegetate areas identified by COR in accordance with Section 32 92 20 – Seeding and Soil Supplements.

END OF SECTION

SECTION 31 23 02
COMPACTING EARTH MATERIALS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of compacting earth materials in prices offered in the Price Schedule for compacting backfill, and for other items of work where earth materials are required to be compacted.

   a. Includes:

      1) Furnishing water and moistening materials.

      2) Processing of backfill material to meet maximum particle size limitations.

      3) Contractor Quality Testing.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1.	ASTM D422-63(2007)	Particle-Size Analysis of Soils
2.	ASTM D653-20e1	Terminology Relating to Soil, Rock, and Contained Fluids
3.	ASTM D698-12	Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
4.	ASTM D1140-00(2017)	Amount of Material in Soils Finer than the No. 200 (75-µm) Sieve
5.	ASTM D1556-15	Density and Unit Weight of Soil in Place by the Sand-Cone Method
6.	ASTM D2216-19	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
7.	ASTM D2487-17e1	Classification of Soils for Engineering Purposes (Unified Soil Classification System)
8.	ASTM D2488-17e1	Description and Identification of Soils (Visual-Manual Procedure)

9.	ASTM D4253-16	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
10.	ASTM D4318-17e1	Liquid Limit, Plastic Limit, and Plasticity Index of Soils
11.	ASTM D4546-14	One-Dimensional Swell or Collapse of Cohesive Soils
12.	ASTM D4647/D4647M-13	Identification and Classification of Dispersive Clay Soils by the Pinhole Test
13.	ASTM D4718-87(2015)	Correction of Unit Weight and Water Content for Soils Containing Oversize Particles
14.	ASTM D4914-16	Density of Soil and Rock in Place by the Sand Replacement Method in a Test Pit
15.	ASTM D5030-13	Density of Soil and Rock in Place by the Water Replacement Method in a Test Pit
16.	ASTM D5080-20	Rapid Determination of Percent Compaction
17.	ASTM D6572-20	Determining Dispersive Characteristics of Clayey Soils by the Crumb Test
18.	ASTM D6938-17a	In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depths)
19.	ASTM D7382-20	Determination of Maximum Dry Unit Weight and Water Content Range for Effective Compaction of Granular Soils Using a Vibrating Hammer
20.	ASTM D7928-17	Standard Test Method for Particle-Size Distribution of Fine-Grained Soils Using the Sedimentation Analysis

B. Bureau of Reclamation (USBR)

1. Guidelines for Earthwork Construction Control Testing of Gravelly Soils, Earth Sciences and Research Laboratory, Technical Service Center, Bureau of Reclamation, Denver, Colorado, September 2008
2. USBR EM – Earth Manual, Part 2, Third Edition (1990)

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 31 23 02-1, Test Results:

1. Results of tests listed in Table 31 23 02A - Contractor Materials Testing Requirements and Frequency.
2. Include test date, time, location and person performing tests.
3. Notify COR within 2 hours if testing does not meet specified requirements.

C. RSN 31 23 02-2, Method Specification Verification:

1. Provide a plan for compaction methods.
2. Provide a description of anticipated equipment and methodology in accordance with this section.
3. Provide a plan for performing in-situ density measurements by methods applicable with the oversize material. Submit in-situ density testing results in accordance with RSN 31 23 02-1.

1.04 DEFINITIONS

A. Use definitions from ASTM D653.

B. Control Fraction: The portion of a soil sample consisting of particles smaller than a designated sieve size. The fraction is used to compare in-place unit weight with standard laboratory unit weight. The control sieve size depends on the laboratory test used to determine laboratory maximum density.

C. C-Value: The ratio expressed as a percentage of (1) in-place unit weight at fill moisture content to (2) the wet unit weight of a laboratory-compacted specimen prepared at fill moisture content as determined by the rapid method of construction control in accordance with ASTM D5080. The C-Value is a comparison of compactive effort of field compaction equipment to standard laboratory compactive effort.

D. D-value: The ratio expressed as a percentage of (1) in-place wet unit weight at fill moisture content to (2) laboratory maximum wet unit weight as determined from a compaction curve constructed at fill moisture content as determined by the rapid method of construction control ASTM D5080. The D-value is the equivalent of percent compaction in accordance with ASTM D698.

E. Percent Compaction: The ratio expressed as a percentage of the in place unit dry unit weight to the laboratory maximum dry unit weight.

F. Special compaction: Compaction close to structures or in spaces not accessible by standard width rollers.

1.05 AMBIENT CONDITIONS

A. Do not place and compact soil under the following conditions:

1. Rain that creates puddles in clayey or silty materials.

2. Heat or wind or both that dries material below specified moisture conditions.
3. Ice, frost, or snow pockets are visible in soil being placed or in underlying materials.

B. Ambient air temperature below freezing may make placement and compaction operations difficult.
1. Minimize interruptions of operations.
2. Continuous operations may be required to eliminate freezing of materials.
3. Obtain COR approval, before performing operations when ambient air temperatures are below freezing.
4. Cease operations when placed materials are freezing.

PART 2 PRODUCTS

2.01 CLASSIFICATION

A. When required, classify earth materials using the Unified Soil Classification System (USCS) according to ASTM D2487 or ASTM D2488.
1. Gradation tests for classification: ASTM D422 or D1140.
2. Atterberg limits testing for classification: ASTM D4318.

2.02 SOIL TYPES

A. Clean Fill:
1. Any soil except soils with classifications Peat (PT), Organic Silts and Organic Clays (OL and OH), or Elastic Silt (MH) per ASTM D2487.
2. Do not use soils that exhibit expansive or dispersive characteristics in accordance with ASTM D4546, ASTM D4647, or ASTM D6572.
3. Free of roots, stumps, limbs, vegetation, organic matter, and ice.
4. Does not contain construction debris, scrap materials, refuse, man-made wastes, or chemical or hydro-carbon contamination.

B. Do not use frozen soils.

C. Special Gradations and Plasticity:
1. In some cases, special gradations and/or plasticity characteristics may be required. These requirements are in the applicable Section.

2.03 DESIGNATION OF SOILS FOR COMPACTION

A. Requirements for lift thickness, method of compaction, and method of determining degree of compaction depends on whether soil is considered to be silty or clayey, cohesionless, or cohesionless containing some silt and clay.

B. Silty or Clayey Soils:

1. Contains appreciable amounts of fines (more than 15 percent plastic fines or 30 percent non-plastic fines).

C. Cohesionless Soils:

1. Contains few fines (less than 5 percent fines).

D. Cohesionless Soils Containing Some Clay and Silt:

1. Contains some clay and silt (between 5 percent fines and 15 percent plastic fines or 35 percent non-plastic fines).

2.04 MAXIMUM PARTICLE SIZE

A. Soil for compacted backfill:

1. Maximum particle size 3-inches.

B. Soil for structural compacted backfill:

2. Maximum particle size 1 1/2-inches surrounding foundations, structures, or where special compaction techniques are required as shown in the drawings.

C. For material other than compacted backfill, maximum particle size limitations as described in appropriate specification sections.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

A. Clear, grub, and strip.

B. Prepare surface so that first compacted lift will be placed on firm, stable base. Compact surfaces, native subgrade, or foundation to receive backfill or structure foundations to the specified compaction outlined below.

1. Compact surfaces to receive backfill with self-propelled, vibrating, smooth-drum rollers with a minimum operating weight of 15 tons, or other suitable compaction equipment as approved by the COR.

2. Uniformly distribute equipment passes.

3. Compact the surfaces to receive backfill with 6 passes of the required roller.
4. Do not operate roller at speeds exceeding 1.5 miles per hour.
5. Obtain COR approval of foundation conditions prior to founding structures or placing backfill.

C. Allow concrete in structures to attain a minimum compressive strength of 4,000 psi, as determined by the COR, before placing fill material against structures.

3.02 SOIL MOISTURE CONTENT

A. Moisten or aerate material, as necessary, to provide moisture content that will readily facilitate obtaining specified compaction. Add water to soil only in increments that will permit moisture content to be uniform and homogenous throughout each layer after mixing.

B. Silty and Clayey Soils and Cohesionless Soils Containing Some Silt and Clay:

1. Add no more than 2 percent water to fill by sprinkling just prior to compaction when fill is clayey and contains dry clods of clay.
   a. If clayey borrow soil is more than 2 percent below optimum moisture, pre-conditioning and curing may be required to obtain uniform and homogenous distribution of moisture in the clods.
   b. Use of disks, harrows, or rakes may be required to blend moisture in the borrow area.
2. Moisture content during compaction:
   a. Soils controlled by impact compaction.
      1) Not greater than 2 percentage points wet or not less than 2 percentage points dry of optimum moisture content.
   b. Soils controlled by the vibrating hammer.
      1) Within the water content range for effective compaction as determined by ASTM D7382.

C. Cohesionless Soils:

1. Add water during compaction, as necessary, since these soils are free-draining.

D. Determine moisture as follows:

1. ASTM D1556 or,
2. ASTM D4914 or,
3. ASTM D5030 or,
4. ASTM D5080 or,
5. ASTM D2216 or,

6. ASTM D6938.
    a. Correct moisture from the nuclear gauge for gauge error for the specific soils tested and the moisture content of the total material may require adjustment for the control fraction (ASTM D4718).

3.03 PLACEMENT

A. Place soils to be compacted in horizontal layers.

B. If necessary, blend materials so that compacted fill is homogenous and free from lenses, pockets, streaks, voids, laminations, or other imperfections.

3.04 COMPACTION

A. Compact material with following methods and techniques appropriate to type of soil, unless otherwise stated in appropriate Sections.

B. Maximum lift thickness as described below unless otherwise stated in appropriate Sections.

C. Silty or clayey material:
1. Compact with mechanical impact tampers, tamping rollers, vibrating pad foot rollers, rubber tire rollers, other suitable compaction equipment, or equipment travel.
    a. Uniformly distribute equipment passes.
    b. Compact in horizontal layers to compacted thickness of 12-inches or less.
2. Special compaction: Compact with hand-held impact tampers, or small tamping equipment within 3 horizontal feet of structures.
    a. Uniformly distribute effort.
    b. Compact in horizontal layers to compacted thickness of 6-inches.
3. Density:
    a. Percent Compaction, minimum 95 percent with moisture content plus or minus 2 percent of optimum content or,
    b. When directly beneath foundations, Percent Compaction, minimum 98 percent with moisture content plus or minus 2 percent of optimum content.

D. Cohesionless free-draining material:
1. Compact with crawler-type tractors, vibrating drum rollers, surface plate vibrator, or similar equipment.
    a. Uniformly distribute equipment passes.
    b. Compact in horizontal layers to compacted thickness of 12-inches or less.

2. Special compaction: Compact with hand-held impact tampers, vibrating plate tampers, or small tamping equipment within 3 horizontal feet of structures.
   a. Uniformly distribute effort.
   b. Compact in horizontal layers to compacted thickness of 6-inches.
3. Density:
   a. Percent Compaction, minimum: 95 percent.

E. Cohesionless soils containing some silt and clay:
1. Compact in accordance with silty or clayey or cohesionless free-draining material procedure above.
   a. Refer to laboratory density testing as to which compaction method to use. If ASTM D698 is used for maximum density, compact as a silty or clayey material. If ASTM D7382 is used for maximum density, compact as cohesionless free-draining material.
2. Special compaction in accordance with silty or clayey material procedure above.
3. Density:
   a. Percent Compaction, minimum 95 percent with moisture content plus or minus 2 percent of optimum content or,
   b. When directly beneath foundations, Percent Compaction, minimum 98 percent with moisture content plus or minus 2 percent of optimum content.

F. Demonstration:
1. Lift thicknesses may vary depending on equipment and methods. Before changing requirements in this Section, demonstrate that required density will be obtained and approval of the COR.

3.05 MEASURE OF COMPACTION

A. Determine unit weight of soils in-place using one of the following methods:
1. Silty or Clayey and Cohesionless Soils:
   a. ASTM D1556 or,
   b. ASTM D4914 or,
   c. ASTM D5030 or,
   d. ASTM D6938.

B. Determine soil compaction by one of the following.
1. Silty or clayey soils:
   a. Percent Compaction:

1) Rapid Method: ASTM D5080.

2) Laboratory Compaction Test: Comparison of in-place dry unit weight of minus no. 4 sieve size control fraction to laboratory maximum dry unit weight as determined by ASTM D698, Procedure A.

2. Cohesionless soils:

a. Percent Compaction:

1) In-place dry unit weight compared to the maximum dry unit weight determined by ASTM D7382.

3. Cohesionless Soils Containing Some Silt and Clay:

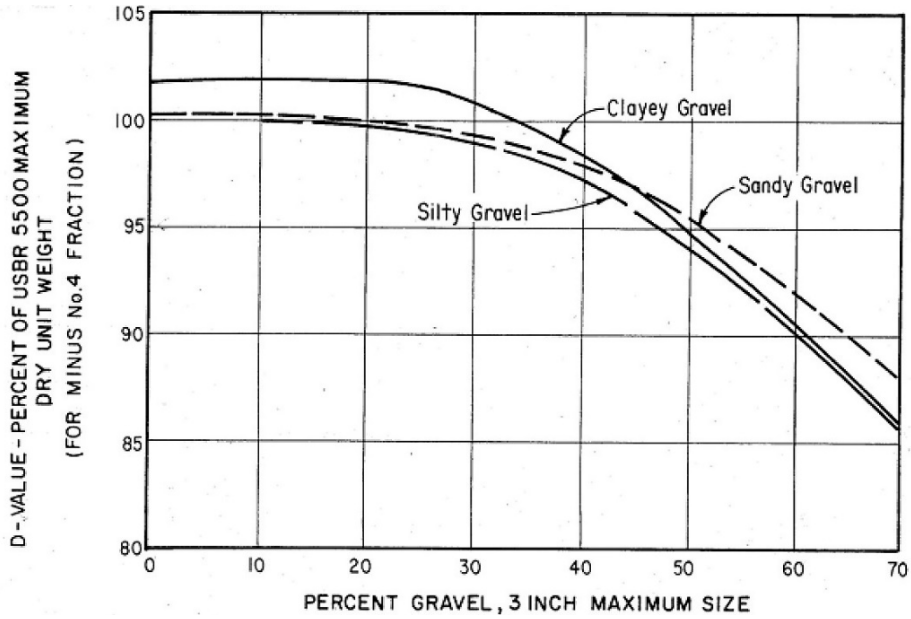
a. Use whichever testing procedure result requires higher in-place dry density.

b. generally use ASTM D7382 with up to 15 percent plastic fines or 35 percent non-plastic fines). And ASTM D698 for higher percentages of fines.

C. Adjustment:

1. For soils with 5 to 30 percent oversized particles: In-place unit weight of minus no. 4 size control fraction determined by screening gravel, washing, and determining mass and volume by assuming surface saturated dried moisture as outlined in ASTM D4718.

2. For soils containing greater than 40 percent oversized particles: Required D ratio or Percent Compaction may be adjusted in accordance with appropriate curve on the figure below:



D. Measure of compaction is not required for backfill placed by method specification, beyond the requirements of approved submittal RSN 31 23 02-2.

3.06 CONTRACTOR FIELD QUALITY TESTING

A. Testing:

1. Independent testing laboratory shall perform sampling, testing, and reporting as required in Table 31 23 02A - Contractor Materials Testing Requirements and Frequency.

   a. Independent testing laboratory shall meet requirements specified in Section 01 46 20 - Testing Agency Services.

2. Notify the independent testing laboratory and Government 24 hours before compaction work begins and 24 hours before significant change in compaction operations (major change in equipment or procedure used).

3. Notify the independent testing laboratory and Government immediately of equipment change due to breakdown, or re-deployment.

4. Testing Frequency:

   a. At a minimum, perform test at frequencies specified in Table 31 23 02A - Contractor Materials Testing Requirements and Frequency.

   b. Greater frequency of testing is normally performed at beginning of new work, new work crew, or new equipment.

   c. After a successful work operation pattern is established, testing frequency may be performed at the minimum guidelines.

   d. Perform additional tests at sites considered questionable by the Government; such as suspected incomplete compaction, surfaces that may

have become excessively wet or dry since compaction, compacted surfaces torn up by subsequent equipment travel, or other similar circumstances. Frequency of additional testing is at discretion of the Government.

Table 31 23 02A - Contractor Materials Testing Requirements and Frequency

PROCEDURE	TEST STANDARD	STANDARD TITLE	MINIMUM FREQUENCY OF TESTING
Soil Classification	ASTM D2487	Classification of Soils for Engineering Purposes	As necessary to classify material to meet specification requirements or to index material for determining density by nuclear method.
	ASTM D2488	Description and Identification of Soils	
Moisture Content	ASTM D2216	Laboratory Determination of Water (Moisture Content of Soil and Rock by Mass.	With in-place density or as required to index material for determining density by nuclear method.
Laboratory Compaction (Standard Effort)	ASTM D698, Procedure A.	Laboratory Compaction Characteristics of Soil Using Standard Effort	One test every 500 yd^3 Minimum 1 test per day per compacted backfill operation, regardless of amount of material placed.
Laboratory Compaction (Vibratory Hammer)	ASTM D7382	Standard Test Methods for Determination of Maximum Dry Unit Weight and Water Content Range for Effective Compaction of Granular Soils Using a Vibrating Hammer	One test every 500 yd^3 Minimum 1 test per day per compacted backfill operation, regardless of amount of material placed.
Oversized Correction	ASTM D4718	Correction of Unit Weight and Water Content for Soils Containing Oversize Particles	When oversize material is between 5 to 40 percent
Rock Factor		USBR Guidelines for Earthwork Construction Control Testing of Gravelly Soils	When oversize material is greater than 40 percent
Sand Cone or Water Replacement	ASTM D1556 or ASTM D5030	Density and Unit Weight of Soil in Place by the Sand-Cone or Water Replacement Method	One test for every 10 Nuclear Density tests.

Table 31 23 02A - Contractor Materials Testing Requirements and Frequency

PROCEDURE	TEST STANDARD	STANDARD TITLE	MINIMUM FREQUENCY OF TESTING
Nuclear Method	ASTM D6938	In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)	One test every 200 yd^3 Minimum 4 test per day per compacted backfill operation, regardless of amount of material placed. Minimum 1 test per foundation prior to concrete placement. Tests are inaccurate in soils with oversized particles.

B. Contractor Support:

1. Provide timely access to areas for density testing and excavate and level an area in compacted material to provide a surface for testing.
   a. Test fills compacted by sheepsfoot rollers one or two lifts below surface.
2. Government may select location of testing.
3. When density is being measured by a sand-cone device (ASTM D1556), cease construction activity in immediate vicinity of testing.
4. Dig test pits as requested to examine compacted soil against structures or pipe.
5. Backfill test pits to original requirements.
6. Provide warning lights, flags, or other safety devices as needed by testing personnel.
7. Provide adequate lighting for performing test if required because of darkness.

3.07 FIELD QUALITY ASSURANCE

A. The Government may perform testing as required to verify contractor quality testing. If the Government performs quality assurance testing, provide support as required for contactor quality testing.

END OF SECTION

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SECTION 31 23 11
EARTHWORK FOR PIPE AND STRUCTURES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Excavation for Structures:

1. Measurement: Made to excavation paylines shown on the drawings or to paylines directed by the COR.
   a. Regardless of quantities removed, measurement for payment will be made to the prescribed paylines.
   b. For safety or other reasons, the Government reserves the right to require the Contractor to excavate beyond the prescribed paylines.
   c. Measurement for payment for additional excavation will be made to limits directed by COR and approved by CO.
2. Payment: Unit Price of cubic yard offered in the Price Schedule.
   a. Includes cost of labor and materials for work necessary to maintain excavations in good order during construction; shoring systems, dewatering systems, removing such temporary construction, where required, and disposing the excavated material.
   b. Overexcavation performed beyond specified or directed paylines and backfill and compaction of backfill for such overexcavation shall be at the expense of the Contractor.

B. Earthwork for Pipe Trench:

1. Measurement: Made to excavation paylines shown on the drawings or to paylines directed by the COR.
   a. Regardless of quantities removed, measurement for payment will be made to the prescribed paylines.
   b. For safety or other reasons, the Government reserves the right to require the Contractor to excavate beyond the prescribed paylines.
   c. Measurement for payment for additional excavation will be made to limits determined by COR and approved by CO.
2. Payment: Unit price of cubic yard offered in the Price Schedule.
   a. Includes cost of labor and materials for work necessary to maintain excavations in good order during construction; removing such temporary construction, where required, and disposing the excavated material.

b. Includes cost of labor and materials for work necessary to backfill excavations after pipe installation including processing excavated material for backfill.

c. Overexcavation performed beyond specified or directed paylines and backfill and compaction of backfill for such overexcavation shall be at the expense of the Contractor.

C. Compacted Backfill about Structures:

1. Measurement: Made to structure lines, excavation lines, and compacted backfill lines shown on the drawings unless otherwise directed by COR.

2. Payment: Unit price of cubic yard offered in the Price Schedule.

a. Includes cost of furnishing water and moistening materials.

b. Compacting refill outside of excavation paylines shall be at the expense of the Contractor.

D. Compacted Backfill about Pipe Trench:

1. Measurement: Made to structure lines, excavation lines, and compacted backfill lines shown on the drawings unless otherwise directed by COR.

2. Payment: Unit price of cubic yard offered in the Price Schedule.

a. Includes cost of furnishing water and moistening materials.

b. Compacting refill outside of excavation paylines shall be at the expense of the Contractor.

1) Does not include backfill compaction for asphaltic concrete replacement.

1.02 DEFINITIONS

A. Additional Excavation: Excavation beyond specified lines as directed by the COR to remove unsuitable foundation material.

B. Overexcavation: Excavation performed for the convenience, fault, or operation of the Contractor beyond specified or directed additional excavation lines.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittals.

B. RSN 31 23 11-1, Excavation and Backfill Plan for Control Valve Structure:

1. Include written narrative describing methods for excavation, shoring, foundation preparation, unwatering/dewatering, and backfilling.

2. Include list of excavation and compaction equipment to be used, shoring equipment and methods for installation.
3. Include sketches, figures, and/or photos that facilitate clear understanding of the excavation method.
4. Include written narrative considerations for worker safety, protection of nearby structures, and analysis of mitigating foreseeable risks.

C. RSN 31 23 11-2, Excavation and Backfill Plan for Pipeline Trench and Flowmeter Vault:

1. Include written narrative describing methods for excavation, shoring, foundation preparation, unwatering/dewatering, and backfilling.
2. Include list of excavation and compaction equipment to be used, shoring equipment and methods for installation.
3. Include sketches, figures, and/or photos that facilitate clear understanding of the excavation method.
4. Include written narrative considerations for worker safety, protection of parallel existing in-use, low head-pressurized pipeline, nearby structures, and analysis of mitigating foreseeable risks.

PART 2 PRODUCTS

2.01 EXCAVATED MATERIALS

A. The Contractor's operations in excavations shall be such that excavations will yield as much suitable material for use in permanent construction required under these specifications as practicable.

B. Place excavated materials which are too wet for immediate compaction temporarily in stockpiles until moisture content is reduced sufficiently to permit them to be placed in required elements of work.

2.02 MATERIAL FOR BACKFILL

A. Type and amount of material used for backfill, and manner of depositing material shall be subject to approval.

B. Obtain backfill material from required excavations. If sufficient suitable material is not available from this source, obtain from commercial sources.

1. The Government makes no guarantee that specified backfill materials are contained in or can be processed from materials excavated.
2. Commercial sources shall be approved by CO.

C. Backfill shall meet the following requirements:

1. Select mixture of sand, gravel and silt.
2. Thoroughly mixed and reasonably well-graded mixture.
3. Maximum Particle Size: 3-inches except,
   a. Within 1-foot of outside of pipe for:
      1) Steel Piping: 3/4 - inches.
      2) HDPE Pipe: 1 1/2 - inches.
   b. 1 1/2-inches surrounding foundations, structures, or where special compaction technical are required in accordance with Section 31 23 02 – Compacting Earth Materials.
4. Free of peat and other organic materials, debris and trash.

D. Do not place material in backfill when either the material or the surfaces on which it is to be placed are frozen.

E. Do not use material removed in stripping for backfill material.

F. Do not use expansive clays and shales for backfill material.

2.03 PIPE BEDDING AND EMBEDMENT

A. Controlled low strength materials shall be in accordance with Section 31 23 70 - Controlled Low Strength Material (CLSM).

B. Processed native materials, shown as select materials on drawings, shall be in accordance with drawings.

PART 3 EXECUTION

3.01 EXCAVATION, GENERAL

A. All work to be done in accordance with Section 01 35 20 – Safety and Health.

B. Excavate structure and pipe foundations to elevations shown on the drawings, unless otherwise established by the COR.

C. The Government reserves the right, during progress of work, to vary slopes, grades, and dimensions of excavations from those specified.

D. The Government does not represent that excavation performed under these specifications can be made to or maintained at paylines shown on the drawings or described in these specifications.

E. Do not excavate in frozen materials without written approval.

F. Blasting: Not allowed.

G. Preserve material below and beyond established lines of excavation in the soundest possible condition.

1. Damage to work due to the Contractor's operations shall be repaired by and at the expense of the Contractor.

2. Material beyond required or prescribed excavation lines which is loosened by the Contractor's operations shall be removed at the expense of the Contractor.

3.02 PREPARATION OF STRUCTURE AND PIPE FOUNDATIONS

A. Prepare foundations at structure and pipe sites by methods which will provide firm, unyielding foundations.

1. Finish bottom and side slopes of excavation, upon or against which the structure or pipe is to be placed, to prescribed dimensions shown on drawings.

2. Moisten and compact prepared surfaces with suitable tools to form firm, unyielding foundations upon or against which to place the structure or pipe in accordance with Section 31 23 02 - Compacting Earth Materials.

B. Where unsuitable material is encountered in the foundation for a structure or pipe, the COR will approve performance of additional excavation to remove unsuitable material.

1. Refill additional excavation with backfill as defined in this section, and compact in accordance with Section 31 23 02 - Compacting Earth Materials.

C. Keep surfaces exposed by excavation moist until concrete, CLSM, coarse aggregate, or earth material are placed on it.

3.03 OVEREXCAVATION

A. If foundation material is excavated beyond lines required to receive the structure, fill overexcavation with suitable materials as defined in this section, and compact in accordance with Section 31 23 02 - Compacting Earth Materials.

B. If foundation material is disturbed or loosened during excavation or otherwise, compact foundation in-place or remove and replace it with suitable material as defined in this section, and compact in accordance with Section 31 23 02 - Compacting Earth Materials.

3.04 DISPOSAL OF EXCAVATED MATERIALS

A. Dispose of excavated materials which are unsuitable for or are in excess of backfill or other earthwork requirements as provided in Section 31 23 39 - Disposal of Excavated Materials, unless otherwise directed by COR.

3.05 PLACING BACKFILL ABOUT STRUCTURES

A. Place backfill to the lines and grades shown on the drawings, unless otherwise determined by the COR.

B. Do not place material in backfill when either the material or the surfaces on which the backfill is to be placed are frozen.

C. Place backfill carefully and spread in uniform layers so that all spaces about rocks and clods will be filled, leaving no voids.

D. Place backfill in lifts:

1. Backfill to be compacted: In accordance with Section 31 23 02 - Compacting Earth Materials.

E. Backfill excavation to match finished grades/lines of adjacent earthwork, unless otherwise directed by COR.

3.06 BEDDING AND EMBEDMENT

A. Place to lines shown on drawings, unless otherwise determined by COR.

B. Place select material to meet requirements of drawings.

C. When select material is to be used for pipe bedding, place select material below bottom of pipe before pipe is installed. Grade select material bedding parallel to bottom of pipe prior to pipe installation.

D. When CLSM is to be used for pipe bedding, place CLSM in accordance with Section 31 23 70 – Controlled Low Strength Material (CLSM).

E. Place bedding and embedment materials to extents shown on drawings.

F. Place bedding and embedment for overexcavation in pipe trenches in the same manner as specified for adjacent bedding and embedment, unless otherwise directed by COR.

G. Place bedding and embedment materials at approximately the same elevation on both sides of pipe to prevent unequal loading and displacement of pipe. Elevation difference on either side of pipe shall not exceed 6-inches.

H. Do not drop materials directly on pipe. Maximum drop height shall not exceed 3.0-feet.

3.07 PLACING BACKFILL AROUND PIPE

A. Place backfill in pipe trenches to lines shown on drawings, unless otherwise determined by the COR.

B. Do not place backfill material when either the material or the surfaces on which it is to be placed are frozen.

C. Place backfill for overexcavation in pipe trenches in the same manner as specified for adjacent backfill.

D. Do not drop backfill materials directly on pipe. Maximum drop height shall not exceed 3.0-feet.

E. Place backfill carefully and spread in uniform layers so that spaces about rocks and clods will be filled, leaving no voids.

F. Place backfill in lifts:

1. Backfill to be compacted: In accordance with Section 31 23 02 - Compacting Earth Materials.

2. Maximum lift height of backfill: 1.0-foot.

G. Place backfill at approximately the same elevation on both sides of pipe to prevent unequal loading and displacement of pipe. Elevation difference on either side of pipe shall not exceed 6-inches.

H. Backfill above previously placed and compacted backfill may be placed as soon as compacting of backfill is completed, although placing of this backfill shall be delayed at locations designated by the COR for the procurement of samples for testing.

I. Place topsoil in areas where earthen surface has been disturbed by construction operations in accordance with Section 31 14 10 – Stripping.

3.08 COMPACTING BACKFILL ABOUT STRUCTURES

A. Place, moisten, and compact materials in backfill as provided in Section 31 23 02 - Compacting Earth Materials.

3.09 PROTECTION

A. To provide adequate protection for backfill about a structure, the Government reserves the right to direct the Contractor to place a sufficient amount of protective, sacrificial backfill over placed backfill within 72 hours after completion of backfill placement or compaction.

B. Provide adequate earth cover over pipe to prevent damage from construction equipment loads.

END OF SECTION

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SECTION 31 23 39
DISPOSAL OF EXCAVATED MATERIALS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of disposal of excavated materials in prices offered in the Price Schedule for items of work requiring disposal of excavated materials:

   a. Includes:

      1) Excavation for Structures.

      2) Excavation for Pipe Trench.

      3) Excavation of Rock.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 DISPOSAL OF EXCAVATED MATERIALS

A. Waste material from required excavation which is not suitable or required for backfill or topsoil.

1. Material from other locations may be disposed of on-site, or off-site in accordance with Section 01 14 10 – Use of Site.

B. Place waste excavated materials as determined by COR.

C. Waste areas for excavated materials shall be as approved by the COR.

D. Do not place waste material in wetlands, within 12 feet of drainage channels.

E. Do not waste material by dumping from top of slope.

F. Grade waste banks to reasonably even and uniform surfaces that blend with natural terrain.

1. Minimum slope: 2 percent.

2. Maximum slope: 4H:1V.

G. Leave surface in a condition that will facilitate natural revegetation.

END OF SECTION

SECTION 31 23 70
CONTROLLED LOW STRENGTH MATERIAL (CLSM)

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of controlled low strength material (CLSM) in linear foot price offered in the Price Schedule for HDPE Pressure Pipe.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1.	ASTM C33/C33M-24a	Concrete Aggregates
2.	ASTM C94/C94M-25	Ready-Mixed Concrete
3.	ASTM C114-24	Chemical Analysis of Hydraulic Cement
4.	ASTM C150/C150M-24	Portland Cement
5.	ASTM C260/C260M-24	Air-Entraining Admixtures for Concrete
6.	ASTM C494/C494M-24	Chemical Admixtures for Concrete
7.	ASTM C618-25a	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
8.	ASTM D4832-23	Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinder

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 31 23 70-1, Approval Data:

1. Mix design with test results showing conformance with specified requirements for compressive strength and spread.
2. Method to prevent pipe flotation while placing CLSM.

C. RSN 31 23 70-2, Contractor Field Quality Testing Results.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Furnish batch ticket with each batch of CLSM in accordance with ASTM C94. Deliver ticket to COR at jobsite during batch delivery.

PART 2 PRODUCTS

2.01 CEMENTITIOUS MATERIALS

A. Cementitious Materials Options:

1. Specified portland cement plus specified pozzolan.
    a. Pozzolan content shall be between 20 and 80 percent of cementitious materials, by weight.
2. Blended hydraulic cement.

B. Portland Cement:

1. In accordance with Section 03 30 00 – Cast-In-Place Concrete.

C. Pozzolan:

1. In accordance with Section 03 30 00 – Cast-In-Place Concrete.

D. Blended hydraulic cement:

1. In accordance with Section 03 30 00 – Cast-In-Place Concrete.

2.02 ADMIXTURES

A. Air-entraining admixture:

1. ASTM C260.

B. Chemical admixtures:

1. Allowable chemical admixtures:
    a. ASTM C494, Type A, D, F, or G.
    b. ASTM C1017, Type I or II.
    c. ASTM C494, Type C and E, provided they do not contain chlorides.
2. Do not use chemical admixtures which contain more than 0.1 percent chloride, by weight.

2.03 WATER

A. ASTM C1602.

2.04 AGGREGATE

A. Aggregate: ASTM C33

1. Maximum particle size: 3/4 inches or 1/8 of open distance between pipe and trench wall, whichever is less.

2.05 MIX

A. Mixture of aggregate, cementitious materials, water, and admixtures:

1. Typical cement content: 2 percent to 10 percent by dry weight of aggregate to obtain specified compressive strength.
2. Make trial mixes prior to placing CLSM to determine mixture adequacy.
   a. Determine compressive strength in accordance with ASTM D4832.
   b. Determine spread in accordance with ASTM D6103.

B. Use one of specified cementitious materials options.

C. Water content: Not to exceed that required to provide a mix that will flow and can be pumped.

D. 7-day Compressive strength, ASTM D4832: Not less than 50 lb/in^2 and not more than 150 lb/in^2.

E. Consistency:

1. Slump, ASTM C143: 8-10 inches.

2.06 CLSM TEMPERATURE

A. CLSM temperature at time of placement: 40 degrees F or greater.

PART 3 EXECUTION

3.01 BATCHING EQUIPMENT

A. Design and operation of mixers: CLSM, as discharged, is uniform in composition and consistency throughout each batch.

3.02 PREPARATION

A. Place pipe on soil pads or other approved compressible material such as extruded polystyrene foam insulation.

3.03 PLACING

A. Do not place CLSM during rain.

B. Place CLSM as per ACI 229R.

C. Place CLSM to lines, grade, and dimensions shown on drawings.

1. Initially, place CLSM from one side of pipe. Where necessary, rod or vibrate CLSM so that CLSM flows under pipe and appears on other side.
2. Add CLSM to both sides of pipe and rod or vibrate until CLSM completely fills space between pipe and trench.
3. Do not disturb pipe trench or allow foreign material to become mixed with CLSM.

D. Prevent pipe from movement, displacement, or floating during placement of CLSM:

1. Restrain pipe, or
2. Place CLSM in lifts.
   a. Contractor shall determine limitation of lift heights to prevent flotation.
   b. Allow sufficient time between lifts for CLSM to cure to a hardened state with sufficient strength to support the weight of a person.

E. Do not place backfill material over CLSM until CLSM has cured to a hardened state with sufficient strength to support the weight of a person.

3.04 CONTRACTOR FIELD QUALITY TESTING

A. Testing:

1. Independent testing laboratory shall perform sampling, testing, and reporting.
   a. Independent testing laboratory shall meet requirements specified in Section 01 46 20 - Testing Agency Services.
2. Obtain samples and test to determine compressive strength in accordance with ASTM D4832, and slump in accordance with ASTM C143.
   a. Testing frequency:
      1) At least once for each shift when placing CLSM.
      2) Once every 100 cubic yard.

3.05 FIELD QUALITY ASSURANCE

A. The Government will obtain samples and test for compressive strength in accordance with ASTM D4832, and slump in accordance with ASTM C143.

3.06 PROTECTION

A. If backfill will not be placed over CLSM within 8 hours, place 6-inch minimum cover of moist backfill over CLSM. Maintain moisture in 6-inch soil cover until additional backfill is placed.

B. If ambient temperature is forecast to be 50 degrees F or less within 8 hours of placing CLSM, place 12-inch minimum additional cover of loose backfill over 6-inch moist backfill cover before end of work day.

END OF SECTION

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SECTION 31 25 10
EROSION CONTROL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Cost:

1. Include cost of erosion control, i.e. straw bales, wattles and silt fence, in prices offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1. ASTM D6461-99(2007) Silt Fence Materials
2. ASTM D6462-03(2008) Silt Fence Installation

B. Washington State Department of Ecology

1. Stormwater Management Manual for Eastern Washington, Department of Ecology, September 2004, Publication 04-10-076, https://fortress.wa.gov/ecy/ezshare/wq/SWMMs/2024SWMMEW/2024_SWMMEW.html

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 31 25 10-1, Silt Fence Certifications:

1. Required by ASTM D 6461.

C. RSN 31 25 10-2, Straw Certification:

1. Certifications that straw for bales or wattles is free of weeds and seeds certified within last 3 years.

1.04 DELIVERY STORAGE AND HANDLING

A. Cover stacks of straw bales or wattles at job site with plastic sheeting until use.

PART 2 PRODUCTS

2.01 SILT FENCE

A. Silt fence, posts, and support fence: ASTM D6461.

2.02 STRAW BALES OR WATTLES

A. Average dry weight not less than 50 pounds each for straw bales or 3 pounds per linear foot for straw wattles.

B. Bind with biodegradable ties.

C. Certified weed and seed free certified within last 3 years.

PART 3 EXECUTION

3.01 SILT FENCE

A. Erect fence at locations as shown on drawings, in accordance with ASTM D6462, except as follows:

1. When support fence is used, securely fasten support fence to upslope side of posts and downslope of silt fence.
   a. Posts less than 3 years old.
2. Extend wire support fence into trench minimum of 2 inches.
3. Do not extend wire support fence more than 36 inches above original ground.

3.02 STRAW BALES OR WATTLES

A. Place straw bales or wattles at locations shown on drawings or as determined by COR.

B. Place straw bales or wattles in rows with ends tightly abutting.

C. Anchor each straw bale or wattle securely with two wood stakes driven through each bale. Drive stakes a minimum of 18 inches into subgrade.

3.03 MAINTENANCE AND REMOVAL

A. Silt fence:

1. Inspect daily.
2. Repair damaged fence.
3. Remove sediment in accordance with ASTM D 6462.

B. Straw bales:

1. Maintain straw bales or wattles during site work.
2. Replace damaged straw bales or wattles.

C. Replace damaged silt fence.

D. Install additional silt fence and straw bale or wattle barriers as directed by the COR.

E. Add silt fences and straw bales or wattles as required at beginning of the construction season.

F. Remove silt fence at completion of construction.

END OF SECTION

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DIVISION 32 – EXTERIOR IMPROVEMENTS

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SECTION 32 12 00
ASPHALTIC CONCRETE REPAIRS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Asphaltic Concrete Replacement:

1. Measurement: Made to repair or remove and replace pay lines directed by the COR.
   a. Measurement for payment for repair, removing and replacement of asphaltic concrete will be made to limits determined by COR.
2. Payment: Unit price of square yard offered in the Price Schedule.
   a. Includes, but not limited to the following:
      1) Cost of labor and materials for work necessary to maintain work area in good order during construction; removing such temporary construction, where required, and disposing the excavated material.
      2) Replace in-kind.
      3) Removal of existing road surfacing and base course materials.
      4) Sub-grade preparation.
      5) Compacting backfill within paved road extents.
      6) Crushed surface base course placement and compaction.
      7) Asphaltic Concrete preparation, placement, and finishing, or in-kind material replacement at unpaved road crossings.
      8) Painted traffic lines and markings.
      9) Signage and safety requirements required by Specifications.
      10) Maintenance of roadside ditches and/or culverts.
   b. Removal performed beyond specified or directed paylines and backfill and compaction of backfill for such excess removal shall be at the expense of the Contractor.
3. Cost:
   a. Include cost of disposal of asphaltic concrete in price offered in the Price Schedule for other items of work.

1.02 REFERENCE STANDARDS

A. Washington State Department of Transportation.

B. Unless otherwise specified herein, design and construction of the paved road surfaces shall meet the requirements of the applicable jurisdiction.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 32 12 00-1, Asphaltic Concrete Repair Plan:

1. Include, as a minimum, the following:
   - a. Replace in-kind.
   - b. Details and source(s) of construction materials.
     - 1) Include company name, hours and dates of operation, address, phone number, and distance from project site.
   - c. Details of construction methods and equipment to be used.
   - d. Requirement preparation, finishing, or other work necessary.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Comply with all applicable Federal, State, and local requirements.

PART 2 PRODUCTS

2.01 MATERIALS FOR ROAD CROSSING

A. All materials used for the road crossing shall meet minimum specification requirements of Washington Department of Transportation and the applicable jurisdiction.

1. In the case of conflict, the more stringent criteria shall apply.

PART 3 EXECUTION

3.01 PREPARATION

A. Grade and prepare subgrade to receive backfill material in accordance with Section 31 23 11 – Earthwork for Pipe and Structures.

B. Obtain COR approval of subgrade before placing surfacing.

3.02 COMPACTING BACKFILL

A. In accordance with Section 31 23 02 – Compacting Earth Materials.

3.03 CONTRACTOR CONSTRUCTION ACITIVITIES

A. All construction activities for the road crossing shall meet requirements of Washington Department of Transportation and the applicable jurisdiction.

3.04 CONTRACTOR FIELD QUALITY TESTING

A. Contractor's independent testing agency shall perform sampling, testing and reporting in accordance with Section 01 46 20 – Testing Agency Services.

B. The Government may accept results of the Contractor's quality control testing as quality assurance testing results.

1. The Government reserves the right to conduct independent quality assurance testing, at the discretion of the COR.

C. Notify COR immediately of test results showing failure of materials to meet specifications.

D. Submit reports of test results as specified.

3.05 FIELD QUALITY ASSURANCE

A. Testing:

1. The Government may perform Quality Assurance tests as required to verify that type of materials used, placement, and compaction of asphaltic concrete conform to contract requirements. This testing is in addition to the Contractor's Quality Control program and does not relieve the Contractor of performing adequate Quality Control testing.
2. Notify the COR 24 hours before beginning paving work and 24 hours before significant change in paving operations (major changed in equipment or procedure used).
3. Notify the COR immediately of equipment change due to breakdown, or re-deployment.

B. Contractor Support:

1. Provide warning lights, flags, or other safety devices as needed by testing personnel.
2. Provide adequate lighting for performing test if required because of darkness.

3.06 MAINTENANCE

A. Maintain paved areas until acceptance of work by the COR.

3.07 RECORD DOCUMENTS

A. As stipulated by applicable jurisdictions.

END OF SECTION

SECTION 32 15 10
GRAVEL SURFACING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Gravel Surfacing:

1. Measurement: Volume of placed compacted material for road crossings and to specified thickness.
2. Payment: Cubic yard price offered in the Price Schedule:
   a. Includes:
      1) Geotextile.

B. Cost: Include excavation and backfill costs in applicable prices offered in the Price Schedule.

C. No payment will be made for excavation and replacement or refill of excavation beyond prescribed excavation limits.

1.02 REFERENCE STANDARDS

A. Washington State Department of Transportation (WSDOT)

1. WSDOT Standard Specifications — Standard Specifications for Road, Bridge, and Municipal Construction 2014 (amended April 7, 2014)

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 32 15 10-1, Certification and Laboratory Test Results:

1. Certification and laboratory test results demonstrating gravel surfacing meets material specifications.

C. RSN 32 15 10-2, Geotextile Installation:

1. Manufacturer's recommendation.

D. RSN 32 15 10-3, Geotextile Certification:

1. Geotextile meets specified chemical, physical, and manufacturing requirements.

PART 2 PRODUCTS

2.01 GRAVEL

A. Gravel Gradation: In accordance with Table 32 15 10A Gravel Surfacing.

Table 32 15 10A - Gravel Surfacing

Sieve Size	Percent Passing
2-inch	75-100
No. 4	22-100
No. 200	0-10

2.02 WATER

A. Required for compacting gravel surfacing.

B. In accordance with Section 01 51 00 – Temporary Utilities.

2.03 GEOTEXTILE

A. 170N non-woven geotextile, manufactured by Mirafi, www.tencate.com; or equal, with the following essential characteristics:

1. Grab Tensile Strength (ASTM D4632): 180 lb.
2. Elongation (ASTM D4632): 50 percent.
3. Puncture Strength (ASTM D6241): 400 lb.
4. Apparent Opening Size (ASTM D4751): 70 US Sieve size.

PART 3 EXECUTION

3.01 PREPARATION

A. Replace gravel surfacing in-kind.

B. Clear surface of loose and deleterious material. Ensure top 6-inches of roadbed is free from depressions and soft spots.

C. Excavate in dry conditions.

D. Remove unsuitable or unstable material below finished subgrade.

E. Grade and prepare subgrade to receive backfill material in accordance with Section 31 23 11 – Earthwork for Pipe and Structures.

F. Obtain COR approval of subgrade before placing surfacing.

3.02 GEOTEXTILE

A. Place at road crossings, and other areas as directed by COR.

B. Place in accordance with manufacturer's recommendations.

C. Do not tear geotextile during placement and compaction of gravel surfacing.

3.03 PLACING AND COMPACTING

A. Obtain COR approval of subgrade before placing surfacing.

B. Place gravel surfacing at following locations:

1. Road crossings.
2. Replace in kind at existing locations.

C. Place, moisten, and compact gravel surfacing in accordance with Section 31 23 02 - Compacting Earth Materials.

3.04 DISPOSAL

A. Dispose of excess and unsuitable materials in accordance with Section 31 23 39 – Disposal of Excavated Materials.

3.05 CONTRACTOR FIELD QUALITY TESTING

A. In accordance with Section 01 46 20 – Testing Agency Services.

END OF SECTION

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SECTION 32 92 20
SEEDING AND SOIL SUPPLEMENTS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Seeding and Soil Supplements:

1. Measurement: Area along surface of disturbed areas seeded, or as determined by the COR.
2. Payment: Unit price of acre offered in the Price Schedule.

1.02 DEFINITIONS

A. Pure live seed content: Weight of seed times percent purity times percent germination.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 - Submittals.

B. RSN 32 92 20-1, Seeding Plan:

1. Qualifying experience for person responsible for supervision of seeding, for approval.
2. Names, addresses, and telephone numbers of references.
3. Equipment.
4. Name and address of seed suppliers.

C. RSN 32 92 20-2, Certifications:

1. Origin of seed.
2. Percent purity and germination.
3. Prohibited and restricted weed seed content.

1.04 DELIVERY STORAGE AND HANDLING

A. Seed containers:

1. Sealed.
2. Labeled:
   a. Identify seed origin on label.
      1) Intrastate shipping: In accordance with Washington State Seed Laws and Regulations.

2) Interstate shipping: In accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act.

1.05 AMBIENT CONDITIONS

A. Preferred Seeding Window: Seed shall be applied between September 1 and November 1, and soil temperature shall be less than 60 degrees F but above 32 degrees F.

1. Do not seed or fertilize when ambient temperature is below 38 degrees F without approval of the COR.

B. Alternate Seeding Window: Spring, after snow melt.

1. Do not seed or fertilize when ambient temperature is below 38 degrees F without approval of the COR.

C. Do not seed or fertilize when ground is snow covered.

D. Do not seed, fertilize, or mulch, or hydroseed when wind velocities prevent uniform application of materials or would drift materials.

PART 2 PRODUCTS

2.01 SEED

A. Weed seeds classified by Washington State Seed Department:

1. Prohibited noxious weeds: None
2. Restricted noxious weeds: 0.5 percent maximum, by weight.

B. Seed mixture:

1. Purity, minimum: 85 percent.
2. Germination, minimum: 85 percent.
   a. Germination test: Less than 1 year old at time of seeding.
3. Uniform mixture shown in:
   a. Table 32 92 20A - Upland Seed Mixture.

Table 32 92 20A – Upland Seed Mixture

Common Name	Scientific Name	Percentage of mix
Blue Wildrye	Elymus glaucus	26%
Bluebunch Wheatgrass	Pseudoroegneria spicata	14%
Idaho Fescue	Festuca idahoensis	18%
Mountain Brome	Bromus marginatus	18%
Prairie Junegrass	Koeleria macrantha	14%
Sandberg Bluegrass	Poa secunda sandbergii	10%

2.02 FERTILIZER

A. Agricultural grade nitrogen fertilizer and phosphate fertilizer.

1. Nitrogen fertilizer: Urea (46-0-0).
2. Phosphate fertilizer: mono ammonium phosphate.

B. Agricultural grade limestone amendment.

2.03 STRAW MULCH

A. Wheat or barley straw.

B. Free of mold or other evidence of decomposition.

C. Free from weed seed within the last 3 years.

2.04 HYDROMULCH

A. Mat-Fiber Plus, manufactured by Mat Inc.,12402 Hwy 2, Floodwood, MN 55736, 1-888-477-3028; Spray Mulch X-80 manufactured by Pacific Wood Fibers, PO Box 2109, Redmond WA 98052; or equal, having the following essential characteristics:

1. Wood cellulose fiber.
2. No germination or growth inhibiting factors.
3. Dyed appropriate color to allow visual metering of application.
4. Evenly dispersed and suspended when agitated in water.
5. Forms blotter like ground cover that readily absorbs water and allows infiltration to underlying soil.

2.05 TACKIFIER

A. Mixture of at least three specially blended compatible hydrocolloids.

1. One hydrocolloid will act as a slippery agent during suspension.
2. Will form loose, long-chain-like film on drying.

3. No growth or germination inhibiting factors.
4. Hydrates and disperses in circulating water to form homogeneous slurry.
5. Equilibrium air dry moisture content at time of manufacture of 8 percent, plus or minus 2 percent.
6. Minimum water holding capacity: 6-1/2 times weight of dry material.

PART 3 EXECUTION

3.01 SEEDBED PREPARATION

A. Complete prior to seeding, and mulching or hydromulching.

B. Scarify or harrow and rake topsoil to minimum depth of three inches.

C. Remove stiff clods, lumps, roots, litter, stones, and other foreign material greater than 6 inches in size from the surface. Dispose of removed materials in accordance with Section 01 74 00 – Cleaning and Waste Management.

D. Fill or smooth topsoil surface to remove rills, gullies and depressions.

E. Protect prepared topsoil surfaces from erosion and washouts. Repair damaged surfaces as required.

3.02 FERTILIZING

A. Test soil to determine if a limestone amendment is required.

1. Do not apply fertilizer within 10 days of adding limestone amendment to topsoil.

B. Apply nitrogen fertilizer uniformly at a rate of 30 pounds of nitrogen content per acre (65 pounds per acre of Urea).

C. Apply phosphate fertilizer uniformly at a rate of 50 pounds of P_2O_5 content per acre.

D. When fertilizer applied before seeding, disc or harrow fertilizer into top three inches of soil.

3.03 SEEDING

A. Apply seed and mulch by hydroseeding.

B. Apply seed mixture in percentages specified in Table 32 92 20A – Upland Seed Mixture.

C. Apply at Seeding Rate of 20 pounds per acre.

1. Upland Seed Mixture shall be applied to disturbed ground associated with construction of the pipeline.

D. Hydroseed immediately upon fine grading. Seed again between September 1 and November 1 of the following year if seed was applied between September 1 and November 1. If seed was applied in the spring, seed again during the fall seeding window for that year, followed by reseeding the following year.

3.04 HYDROSEEDING

A. Seed slurry:

1. Mix to keep homogeneous.
2. Ingredients:
   a. Water
   b. Seed
   c. Wood cellulose fiber mulch:
      1) Rate: 1,000 pounds per acre at 10 percent moisture content.
      2) Add to water slurry after seed.
   d. Fertilizer may be applied with hydroseeding.
3. Maximum time between batching slurry and application: 1 hour.

B. Spray apply seed slurry mix uniformly.

C. Use mulch coloring as metering agent.

D. Apply seed slurry before mulch slurry.

3.05 HYDROMULCHING

A. Mulch slurry:

1. Mix to keep homogeneous.
2. Ingredients:
   a. Water.
   b. Tackifier.
   c. Wood cellulose fiber mulch: 3,000 pounds per acre at 10 percent moisture content.
   d. Nitrogen fertilizer may be applied with hydromulching.
3. Maximum time between batching slurry and application: 1 hour.

B. Spray apply mulch slurry mix uniformly.

C. Use mulch coloring as metering agent.

D. Apply mulch slurry within 24 hours after applying seed.

3.06 HYDROSEEDING AND HYDROMULCHING

A. Slurry:

1. Mix to keep homogeneous.
2. Ingredients:
   a. Water
   b. Tackifier
   c. Seed
   d. Wood cellulose fiber mulch:
      1) Rate: 4,000 pounds per acre at 10 percent moisture content.
      2) Add to water slurry after seed.
   e. Fertilizer may be applied with hydroseeding.
3. Maximum time between batching slurry and application: 1 hour.

B. Spray apply slurry mix uniformly.

C. Use mulch coloring as metering agent.

END OF SECTION

DIVISION 33 – UTILITIES

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SECTION 33 05 30
EQUIPMENT VAULTS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Control Valve Vault:

1. Payment: Lump sum prices offered in the Price Schedule:

   a. Includes:

      1) Control valve vault.
      2) Miscellaneous metalwork.
      3) Floor Access hatches.
      4) Pipe and conduit penetration seals.
      5) Metal building system.

B. Flowmeter Vault:

1. Payment: Lump sum prices offered in the Price Schedule:

   a. Includes:

      1) Flowmeter vault.
      2) Miscellaneous metalwork.
      3) Floor Access hatches.
      4) Pipe and conduit penetration seals.
      5) Metal building system.

C. Cost:

1. Include cost of excavation for vault structures in price offered in the Price Schedule for Excavation for Structures.
2. Include cost of compacted backfill for vault structures in price offered in the Price Schedule for Compacted Backfill about Structures.

1.02 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC)

1. AISC 360-16 Specifications for Structural Steel Buildings

B. American National Standards Institute (ANSI)

1. ANSI A14.3-2008 — Ladders – Fixed – Safety Requirements
2. ANSI A1264.1-2017 — Safety Requirements for Workplace Walking/Working Surfaces and Their Access; Workplace, Floor, Wall and Roof Openings; Stairs and Guardrail Systems

C. American Welding Society

1. AWS D1.1/D1.1M:2015 — Structural Welding Code - Steel

D. Code of Federal Regulations (CFR)

1. 29 CFR Part 1910, Subpart D — Occupational Safety and Health Administration (OSHA) Standards – Walking-Working Surfaces

E. Federal Acquisition Regulations (FAR)

1. FAR 52.246-21 — Warranty of Construction

F. International Code Council (ICC)

1. IBC-2015 — International Building Code

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittals.

B. RSN 33 05 30-1, Control Valve Vault Construction Schedule and Installation Plan:

1. Contractor shall submit a detailed, complete installation plan for the Control Valve Vault, including the following minimum details:
   a. Clearly describe all equipment, personnel, and methods used for installation of new Control Valve Vault.
      1) Provide details for work that will be performed for Control Valve Vault prior to low-flow work period, during low-flow work period, and after low-flow work period.
      2) Include details on excavation plan and temporary shoring around existing buildings in accordance with 31 23 11 – Earthwork for Pipe and Structures.
         a) Include an Emergency Plan if existing facilities shift during excavation.
      3) Include details of concrete placement schedule for Control Valve Vault, (if cast-in-place concrete is used).
      4) Include details of inspection of precast Control Valve Vault concrete after shipping, (if precast is used).

5) Include details on how Control Valve Vault will be installed within Low-Flow Work Period time constraints.

6) Include details for any required connections or attachments to the existing and new steel pipe.

C. RSN 33 05 30-2, Flowmeter Vault Construction Schedule and Installation Plan:

1. Contractor shall submit a detailed, complete installation plan for the Flowmeter Vault, including the following minimum details:

a. Clearly describe all equipment, personnel, and methods used for installation of new Flowmeter Vault.

1) Provide details for work that will be performed for the Flowmeter Vault prior to low-flow work period, during low-flow work period, and after low-flow work period, as needed.

2) Include details of concrete placement schedule specific to Flowmeter Vault, (if cast-in-place concrete is used).

3) Include details of inspection of precast Flowmeter Vault concrete after shipping, (if precast is used).

D. RSN 33 05 30-3, Approval Drawings:

1. Submit checked shop and installation drawings for Control Valve Vault, Flowmeter Vault, and other related appurtenances.

2. Submit checked, detailed shop drawings including dimensions and tolerances, material data, and joint details.

a. If precast vault(s) is used:

1) Shop drawings shall be furnished by precast concrete producer for approval in accordance with Section 03 48 00 – Precast Concrete Structures.

2) Precast concrete units shall be produced in accordance with approved drawings.

3. In Government Format in accordance with Section 01 33 00 – Submittals.

a. Include the following on shop and installation drawings:

1) Show controlling dimensions.

2) Show details of component members and connections.

3) Show type and grade of material, and type of finish.

4) Show steel reinforcement size and placement.

b. Include set of plans and elevations.

c. Show details and methods of installation and anchoring.

d. Show members, sizes and thicknesses, anchorage locations, and accessory items.

e. All field connections shall be clearly marked and noted on shop drawings, indicating size of required fasteners and their locations.

E. RSN 33 05 30-4, Calculations:

1. Submit calculations detailing the design of control valve vault, flowmeter vault, and other related appurtenances.

a. Analysis detailing reinforcement, loading, and corresponding stresses on all vault appurtenances.

b. Indicated compliance with the design requirements in Article 1.04, Design Requirements and applicable industry design standards.

c. Sealed by a professional engineer registered in the State of Washington.

1.04 DESIGN REQUIREMENTS

A. General:

1. Control Valve Vault houses mechanical gate valve equipment.

2. Flowmeter Vault houses flowmeter equipment.

3. Meet minimum interior dimensions according to Drawings:

a. See Drawings 222-D-60360 and 222-D-60361.

4. Refer to drawings for dimensions, approximate elevations, pipe penetrations, access hatches, and piping.

a. Field verify elevations on drawings.

5. Equipment Vaults shall be watertight.

6. Account for openings and penetrations through vaults:

a. Floor access hatches need place for drains.

b. Electrical and mechanical equipment may need openings or penetrations in vaults.

7. Design to comply with OSHA requirements.

8. Design for seismic loading.

B. Miscellaneous metalwork requirements for Equipment Vaults are found in Section 05 50 00 – Metal Fabrications.

C. Access hatch requirements for Equipment Vaults are found in Section 08 31 20 – Floor Access Hatches.

1.05 QUALIFICATIONS

A. Equipment Vault Designer Qualifications: Professional Structural Engineer registered in the State of Washington.

1.06 WARRANTY

A. Warrant control valve vault for extended period in accordance with the clause at FAR 52.246-21, Warranty of Construction.

PART 2 PRODUCTS

2.01 VAULT OPTIONS

A. Vault structures may be constructed by installing a Precast Concrete Vault or by placing a Cast-in-Place Concrete Vault:

1. In accordance with Table 33 05 30A – Equipment Vault Options.

Table 33 05 30A – Equipment Vault Options

Vault Designation	Refer to Section
Precast Concrete Vault	03 48 00 – Precast Concrete Structures
Cast-in-Place Concrete Vault	03 30 00 – Cast-in-Place Concrete

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install ladders and hatches in accordance with approved manufacturer's installation drawings.

C. Earthwork in accordance with Section 31 23 11 – Earthwork for Pipe and Structures.

END OF SECTION

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SECTION 33 09 12
ULTRASONIC FLOWMETER SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Flowmeter:

1. Measurement: Number of Flowmeters of installed.
2. Payment: Unit Price offered in the Price Schedule:
   a. Includes flowmeters, indicator/transmitter, and associated installation hardware.

1.02 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)

1. ASME MFC-5.1-2011(R2024) — Measurement of Liquid Flow in Closed Conduits Using Transit-Time Ultrasonic Flowmeters

B. ASTM International (ASTM)

1. ASTM A240/240M-20 — Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
2. ASTM F593-17 — Stainless Steel Bolts, Hex Cap Screws, and Studs

C. National Electrical Manufacturers Association (NEMA)

1. NEMA 250-20 — Enclosures for Electrical Equipment

1.03 SYSTEM REQUIREMENTS

A. Conform to ASME MFC.5M for flowmeter systems.

1. Flowmeter based on ultrasonic transit time difference principle.

B. Dedicated indicator/transmitter microprocessor-based processing unit indicator/transmitter.

C. Provide an electronic output signal proportional to the flow of liquid in the closed pipe system.

D. Capable of operating up to 100-feet between flowmeter sensor and remote indicator/transmitter.

E. System Pipe Parameters are tabulated below:

Table 33 09 12A – Pipe Parameters for Flow Meter Housing

Flowmeter Type	Ultrasonic
Pipe Sizes, O.D.	42-inch
Pipe Wall Thickness	1.024-inch
Pipe Material	HDPE
Maximum Flowrates	50 cfs
Approx. Velocity Ranges	0 to 6 ft/sec

1.04 SUBMITTALS

A. Submit the following in accordance with the Section 01 33 00 – Submittals.

B. RSN 33 09 12-1, Approval Data:

1. Commercial products data for flowmeter systems:
   a. Sensors with operating cable.
   b. Microprocessor-based processing unit indicators/transmitters.
   c. Mounting assemblies.
   d. Include manufacturer's name, model number, and specification requirements.
2. Detailed installation instructions and drawings showing installation details, detail dimensions, and locations of conduit connections. Include manufacturer's instructions for attaching flowmeter to the pipe and cabling to flowmeter display indicator/transmitter.
3. Schematic and wiring diagrams including those showing connections to external equipment in accordance with Division 26 – Electrical.

C. RSN 33 09 12-2, Final Data:

1. Service Manuals:
   a. Bound service manual containing:
      1) Installation, maintenance, and operating instructions.

2) Identifying parts list.

3) Schematic and wiring diagrams.

4) Recommended parts list.

D. RSN 33 09 12-3, Test Reports:

1. Certified factory calibration report

2. Simulated test reports.

3. Operational test reports.

1.05 DELIVERY, STORAGE AND HANDLING

A. Protect all equipment from corrosion, deformation, and other types of damage during delivery, storage and handling.

PART 2 PRODUCTS

2.01 FLOWMETER SYSTEMS

A. Ultrasonic Flowmeter:

1. FLUXUS F731 as manufactured by FLEXIM, www.flexim.com; SITRANS FS230 as manufactured by Siemens, www.siemens.com; or equal, having the following essential characteristics:

a. Accuracy: Plus or minus 1.0 percent of all flowrate, over the range of measurement designated in Table 33 09 12A –Pipe Parameters, above 1 foot per second. Accuracy to assume at least ten straight pipe diameters upstream of meter.

b. Flowmeter based on ultrasonic transit time difference principle.

c. Suitable for operation in ambient temperatures ranging from -4 to 140 degrees F.

d. Ultrasonic style of flowmeter installed on exterior of pipe.

1) No pipe penetrations allowed.

e. NEMA 250, Type 6 enclosure.

f. Sensor housing: PEEK or stainless steel, ASTM A240, Type 304 or 316.

g. Dedicated indicator/transmitter microprocessor-based processing unit (indicator/transmitter).

h. Provides an electronic output signal proportional to the flow of a conductive liquid in the closed pipe system.

i. Capable of operating up to 100-feet between flowmeter sensor and remote indicator/transmitter.

2. Mounting Assembly:

a. Shall include all components necessary for a full and complete installation, including but not limited to:

1) Mounting track and band straps: Stainless steel, ASTM A240, Type 304 or 316.

a) Suitable for permanent installation.

B. Remote Indicator/Transmitter (Convertor):

1. Same manufacturer as flowmeter.

2. Transmitter to provide the following characteristics:

a. LCD display: 128 x 64 dot, minimum, backlit alphanumeric to indicate flow units and total flow. All menu commands are visible on display.

b. Minimum outputs: Analog 4-20 mA, two digital scaled pulse (totalizer), digital scaled frequency (flowrate), fault, empty pipe detection with positive zero return, and digital port RS232.

a. Microprocessor based with integrated keypad.

b. Display readout to simultaneously display flowrate and totalized flow.

c. User selectable flow measurement units of ft^3/sec and gal/min for flowrate.

d. Internal flow totalizer:

1) Totalize volume (acre-feet) of water flow over time. Nine-digit minimum display of totalized volume in acre-foot with least significant digit in hundredths of an acre-foot. Totalizer retains totalized value upon loss of power.

e. Analog output: Isolated type output. Provide a minimum of one 4 to 20 mA output for flowrate linear to the flows.

f. RS-485 output: Provide Modbus RTU communication.

g. Remote (wall mounted) flowmeter transmitter in IP65 enclosure, with visible display.

1) Mounted at eye-level on wall in flow meter housing.

h. IP65 enclosure.

B. Provide cable between flowmeter and transmitter of type specified by flowmeter manufacturer that is suitable for pulling through conduit. Determine exact cable length and location of conduit. Cable splicing not allowed.

C. Provide brackets, supports, and mounting hardware required to install equipment.

2.02 ELECTRICAL EQUIPMENT

A. Electrical conduit between sensor and indicator/transmitter to be provided in accordance with Division 26 – Electrical.

B. Electrical service for device operation: 120 volt, single phase, 60 hertz.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install new flow measuring devices in accordance with these specifications, and the manufacturer's recommendation at locations approved by the COR.

   a. Install flowmeter sensor:

      1) Exterior: 42-inch HDPE Pipe.

   b. Indicator/Transmitter:

      1) Interior wall of flow meter housing.

B. Mount flowmeter indicators/transmitters to flow meter housing wall at location approved by COR.

C. Signal cable from each transducer/sensor to run in new conduit as follows:

   1. Run all signal cables to new controller cabinet.
   2. Provide rigid and flexible conduit as required.

D. Furnish bolts, brackets, supports, and mounting hardware required to install equipment.

E. Make connections between flowmeter indicators/transmitters and flowmeter sensors:

   1. Cable splicing not allowed.
   2. Cable to run in grounded conduit (flexible and rigid) between flowmeter sensors and respective indicator/transmitter.

F. Make connections between flowmeter indicator/transmitter and incoming power.

G. Electrical:

   1. Install in accordance with Division 26 – Electrical.
   2. Install electrical wiring, shielded telemetry cable, conduit, power supplies, electrical boxes, terminal blocks, and necessary accessories required to complete installation.

3.02 CONTRACTOR FIELD QUALITY TESTING

A. General:

1. Perform tests after installing flowmeter systems.
2. Tests shall be witnessed by COR. Notify COR at least 5-days in advance of when tests are to be performed.
3. Furnish testing equipment and additional hardware necessary for complete testing.
4. Demonstrate that each flowmeter sensor can be installed and retracted from the pipe without draining or depressurizing the system.

B. Simulated Tests: Demonstrate equipment operates in accordance with this Section, including:

1. Apply simulated flow signal inputs. Simulated signals to cover minimum and maximum flows over the velocity range listed in Tables 33 09 12A –Pipe Parameters.
2. Check displays for correct readouts and check each I/O (input/output) point for correct I/O signal.
3. Test each output connection for correct output conformance.
4. Verify all instrumentation and indication devices function properly. Test all functions of flowmeter transmitter for correct operation.

C. Operational Tests: Demonstrate equipment operates in accordance with this Section, including:

1. Test flowmeter during operation for full range of outputs listed in Tables 33 09 12A –Pipe Parameters.
2. Check displays for correct readouts and check each I/O point for correct I/O signal.
3. Verify all instrumentation and devices function properly during pumping operation.

D. Make corrections and adjustments to provide complete calibration and installation per manufacturer's recommendations and satisfactory to COR.

END OF SECTION

SECTION 33 11 18
HDPE PRESSURE PIPE

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. HDPE Pressure Pipe:

1. Measurement: Horizontal length along pipe centerline between ends of pipe in-place.
   a. Continuous through fittings, structures, and road crossings.
   b. Custom pipe fitting to connect new HDPE Pressure Pipe to existing steel lined concrete cylinder pipe (CCP) at the upstream end of the HDPE Pressure Pipe work (Sta. 48+00.00).
   c. Custom pipe fitting reducer to connect new HDPE Pressure Pipe to new Steel Pipe at the downstream end of the HDPE Pressure Pipe work (Sta. 65+68.00).
   d. At locations shown on drawings.
2. Payment: Unit price of linear foot offered in the Price Schedule.
   a. Includes cost of furnishing materials; manufacturing and laying pipe; fabricating miter bends; making connections; flushing, filling, testing, and draining; and furnishing maintenance warranty bond.
   b. Bedding and Embedment Options:
      1) CLSM
      2) Select material

1.02 REFERENCE STANDARDS

A. ASTM International (ASTM)

1.	ASTM D2513-20	Polyethylene (PE) Gass Pressure Pipe, Tubing, and Fittings
2.	ASTM D3350-24	Polyethylene Plastics Pipe and Fittings
3.	ASTM F412-24a	Terminology Relating to Plastic Piping Systems
4.	ASTM F2164-21	Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems using Hydrostatic Pressure

5.	ASTM F2206-19(2024)	Fabricated Fittings of Butt-Fused Polyethylene (PE)
6.	ASTM F2620-24	Heat Fusion Joining of Polyethylene Pipe and Fittings
7.	ASTM F2634-15(2021)	Laboratory Testing of Polyethylene (PE) Butt Fusion Joints using Tensile-Impact Method

B. American Water Works Association (AWWA)

1.	AWWA C906-15	Polyethylene (PE) Pressure Pipe and Fittings, 4 in. (100mm) Through 63 in. (1,575 mm), For Water Distribution and Transmission
2.	AWWA M55	PE Pipe – Design and Installation, 2nd Edition

C. Plastic Pipe Institute (PPI)

1.	TR-33-2012	Generic Butt Fusion Joint Procedure for Field Joint of Polyethylene Pipe

1.03 DEFINITIONS

A. Pipe sizes and classes: Designated on plan and profile drawings by an alphanumeric symbol.

1. HDPE Pipe:
   a. Symbol identifies pipe diameter and dimension ratio as follows:
      1) First number in the symbol indicates nominal diameter in inches.
      2) Alphanumeric indicates dimension ratio as defined in AWWA C906.
      3) A symbol of 42DR41 means the pipe is 42 inches in diameter (nominal) with a dimension ratio of 41.
2. Unless specific reference is made to the outside diameter of pipe, pipe diameters shown on drawings and used in these specifications are inside diameters.
3. Pipe designations shown on drawings and in these specifications establish minimum requirements for pipe types allowed under these specifications.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittals.

B. RSN 33 11 18-1, Qualifications:

1. Certification of Site Superintendent.
2. Certification of pipe laying Foreman.
3. Certifications of line pipe and fitting manufacturers.

C. RSN 33 11 18-2, Pipe Laying Diagrams:

1. Show position and marking of pipe sections.
2. Include centerline stationing and elevations at horizontal and vertical changes in alignment, and subgrade elevation for each pipe segment and fitting.
3. Include Dimension Ratio (DR) or pressure class of pipe segment or fitting.
4. For alignment changes not using a miter bend (pulling joints or using the cold bending radius of HDPE pipe) provide a station at point of curvature and point of tangency, deflection angle at each pulled joint (where used), and maximum bending radius vs. DR-rated cold bending radius for pulled pipes.

D. RSN 33 11 18-3, Shop Drawings:

1. Show pipe and fitting fabrication details including dimensions and installation location which includes station and elevation for each unique pipe segment.
   a. Include custom and standard fittings for connections between all pipe materials.
2. Shop drawings shall clearly denote pipe identifier numbers or mark numbers for installation, as well as any special or unique segments (e.g., miter bends) with station location to be installed.

E. RSN 33 11 18-4, Certification:

1. Pipe shall meet the requirements of AWWA C906 and this specification.
2. Test reports shall be provided for all delivered products, must be correlated to products delivered, and shall match shipping bills.

F. RSN 33 11 18-5, Fusion Procedures:

1. Submit a record for all fusion joints, including the following minimum information:
   a. Pipe size and DR to be joined.
   b. Joint preparation steps with notes and conditions at time of work.
   c. Fusion temperature.
   d. Interface pressure.
   e. Cooling time.
   f. Name of operator performing the joint fusion.
   g. Date and time each joint was made.

G. RSN 33 11 18-6, Pipe Deflection Measurements:

1. Submit a log of all pipe deflection measurements performed, including the following minimum information:

   a. Horizontal and vertical measurements at each location, with a calculation percent vertical deflection.

   b. Station or coordinate location of each deflection measurement location.

   c. Name of person, date, and time each measurement was taken.

   d. Note the method of permanent marking used.

H. RSN 33 11 18-7, Heat Fusion Joint Operator Qualifications:

1. Certifications from manufacturer for each operator to perform fusion joints showing they are qualified to perform fusions on the material, pipe sizes, and equipment to be used.

2. Inspection results from fusion machine or pipe manufacturer showing each operator has successfully passed the required training courses, and is certified to perform joints.

3. Date of Certification.

4. Certification showing each operator is familiar with, and qualified to operate, the joint data logger required to be provided with each fusion machine by these Specifications.

I. RSN 33 11 18-8, Flushing and Draining Plan:

1. Proposed rate, time, and procedure to be used to flush the pipe prior to testing.

2. Note source and discharge locations, total volume, and minimum velocity of flushing water to be used to flush pipe.

J. RSN 33 11 18-9, Filling and Testing Plan:

1. Include all relevant details, including the proposed rate, time, and procedure for:

   a. Filling and equalizing prior to testing.

   b. Contractor field quality testing.

   c. Draining pipeline.

2. Method for removing, transporting, and disposing of water drained from pipe to enable repair of leaks or following successful testing, including discharge location.

K. RSN 33 11 18-10, Floatation Prevention Plan:

1. Show location and describe method of preventing pipe from floating during installation.

2. Provide supporting calculations showing a minimum factor of safety against flotation of 1.0.

1.05 QUALIFICATIONS

A. Contractor shall have successfully installed at least 2 projects of similar pipe size (within 12 inches) and scope within 3 years of this contract award date.

1. Provide project name, location, dates of work, primary contact name, phone number, and email address for each project.

B. Pipe manufacturers shall be certified in accordance with ISO:9001 or similar nationally certified program approved by COR.

C. Line pipe, fittings, and specials manufacturers:

1. 5-years successful experience producing products as specified.
2. Provide references for at least 3 completed projects with similar pipe diameters and pressures.

D. Pipe Layers: Skilled and experienced in laying pipe with butt fusion joints. Minimum 2-years' experience installing pipe with similar pipe diameters and pressures:

1. In the absence of specific pipe material experience, substitution of on-site pipe manufacturer training and quality control is allowed:
   a. Provide manufacturer's representative certified in pipeline installation, including butt fusion joints, for training pipe layers and pipe foreman prior to installation.
   b. In lieu of specific pipe material installation experience, pipe layers and pipe foreman shall still have experience with installation similar pipe diameters and pressures.

E. Heat Fusion Joint Machine Operator:

1. Certified by machine manufacturer or representative.
2. Trained on specific fusion machine, pipe sizes, and heat fusion bonding procedure; and shall:
   a. Perform 1 pipe-to-pipe heat fusion bond and,
   b. One pipe-to-fitting heat fusion bond on each machine to be used.
   c. Heat fusion bonds made as part of operator certification:
      1) Visually inspected and tested in accordance with PPI and ASTM standards.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Ship pipe after receiving COR approval in accordance with this section.

B. Prevent damage to pipe and fittings during loading, transportation, unloading, storing, joining, and laying.

C. Government reserves the right to inspect pipe once it is delivered, in accordance with Section 01 60 00 – Product Requirements.

D. Maintain ovality of HDPE Pressure Pipe:

1. Before shipping, install internal supports in pipe to maintain ovality.
2. Supports:
   a. Two members at 90 degrees to each other.
   b. Minimum member cross section: Nominal 2- by 4-inches.
3. Place supports at 5 feet from ends of each pipe section, unless recommended otherwise by manufacturer.
4. Orient support legs in same axis along pipe centerline.

E. Transport pipe and fittings with padded bolsters. Use heavy padding under ties.

F. Replace or repair, as approved by COR, any pipe that is damaged during shipment, storage, or installation at Contractor's expense.

G. Do not store HDPE Pressure Pipe in unprotected, outside storage for more than 1 year.

PART 2 PRODUCTS

2.01 PIPE

A. HDPE Pressure Pipe: AWWA C906, except;

1. PE material:
   a. Standard PE code designation: PE 4710.
   b. Minimum cell Classification, ASTM D3350: PE 445574C, or E.
2. Pipe:
   a. Minimum continuous pressure rating of pipe.
   b. Each production lot of pipe: Tested for melt index, density, percent carbon, dimensions, and ring tensile strength and results recorded.
   c. Color: Black with 2 to 3 percent minimum carbon black by weight.
   d. Not less than 4 permanent co-extruded, equally spaced, blue color stripes in outside surface of pipe.

B. Size and dimensions shall be as shown on drawings.

1. HDPE dimension ratios (DR) shown on drawings are based on AWWA Iron Pipe Size (IPS) sizes for diameters 4 inches through 63 inches.

2.02 FITTINGS

A. Adapters, couplings, bends, and connections at structures and encasements:

1. Fabricated from HDPE Pressure Pipe in factory unless otherwise specified by COR or as shown on drawings.
2. Equivalent Dimension Ratio (EDR) fittings are acceptable.

B. HDPE Pressure Pipe fittings: Fabricate in accordance with AWWA C906, ASTM F2206, and as shown on drawings.

1. Material: PE 4710.
2. Made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock or molded fittings:
   a. Rated for internal pressure service at least equal to full-service pressure rating of mating pipe.
   b. HDPE Pressure Pipe flange and mechanical joint adaptors: Rated to at least same pressure as mating pipe.
   c. Polyethylene flange or mechanical joint adapters made with sufficient through-bore to be clamped in a butt fusion-joining machine without use of a stub-end holder, as per pipe manufacturer's and fusion machine manufacturer's instructions.

2.03 BEDDING AND EMBEDMENT

A. Select material or CLSM may be used for bedding and embedment of the pipe in the pipe trenches.

1. Select material shall be in accordance with requirements shown on drawings.
2. Controlled Low Strength Material (CLSM) requirements shall be in accordance with Section 31 23 70 – Controlled Low Strength Material (CLSM) and as shown on drawings.

2.04 CONTRACTOR SOURCE QUALITY TESTING

A. HDPE Pressure Pipe and Fittings:

1. Notify COR 14 days before HDPE Pressure Pipe and fittings are to be tested.
2. General: Test manufactured pipe and fittings per the more stringent of AWWA C906 and ASTM F2634.
   a. Completed and documented by qualified personnel.
   b. Government reserves right to:

1) Observe testing while in process and receive testing documentation.

2) Inspect materials both during and after manufacture.

3) Testing reports shall have unique identifiers with shipping bills to verify that pieces shipped below are the same as those tested.

3. Testing requirements:

a. Perform at least one butt fusion in accordance with ASTM F2620 and PPI Technical Report TR-33 on each run of pipe and from each batch of material feedstock:

1) Test using Tensile Impact Test in accordance with ASTM F2634, with passing results prior to shipping pipe.

b. Joints exhibiting yield point lower than unfused pipe or that fails in a brittle mode is considered unacceptable.

c. Unacceptable test result: Government may reject pipe manufactured in same run and from same batch of material feedstock represented by unacceptable test. Manufacturer may, at own expense, supply additional testing to COR.

d. Acceptable test results do not:

1) Mean pipe from pipe run or material feedstock batch will be acceptable.

2) Relieve pipe manufacturer or supplier from liability for defects in material or workmanship of pipe discovered during installation or warranty period.

4. HDPE Pressure Pipe ovality tolerances shall not exceed maximum allowances in ASTM D2513, Table 2:

a. HDPE Pressure Pipe ovality: Plus or minus 2 percent at pipe manufacturing facility.

B. Approval for Shipment:

1. Pipe approval will be determined by inspection, to determine whether pipe conforms to AWWA C906.

2. Notify COR at least 14 days before manufacturing pipe and fittings and 72 hours before shipping pipe.

3. The Government may inspect pipe units and approve for shipment those which have been manufactured and tested in accordance with these specifications.

4. Further inspection of pipe units will be in accordance with the clause at FAR 52.246-12 Inspection of Construction.

2.05 PIPE ACCESSORIES

A. Warning Tape:

1. Polyethylene tape.
2. Thickness: 4 mils.
3. Magnetically detectable.
4. Width, minimum: 6 inches.
5. Color: Blue with silver lettering.
6. Legend repeated at least every 3.0 feet: "CAUTION – WATERLINE BURIED BELOW".

PART 3 EXECUTION

3.01 GENERAL

A. Perform flushing, filling, and testing after backfill has been placed to finished grade or as approved by COR.

B. Protect pipe from contamination, damage, and elements during storage on-site as approved by COR.

C. Install pipe based on the requirements of these Specifications or pipe manufacturer's recommendation, whichever is more stringent.

3.02 INSTALLATION

A. Keep opening to installed pipe closed during work stoppage, including end of work day, breaks, and work delays.

B. If pipe is flooded during construction, clear floodwater by draining and flushing with water, or other COR approved method, until pipe is clean, at the Contractor's expense.

C. Install warning tape over center of pipe at least 18 inches below ground and at least 18 inches above pipe.

3.03 LAYING PIPE

A. Excavate pipe trench in accordance with Section 31 23 11 – Earthwork for Pipe and Structures.

1. Do not excavate existing, parallel concrete cylinder pipeline:
   a. Except at tie-in locations as shown on drawings and in accordance with Section 01 14 12 – Work Restrictions.

2. Grade pipe trenches to provide uniform slope along bottom of pipe.
3. Lower pipe into the trench and place pipe in position such that no soil gets inside the pipe and pipe is not damaged.
4. Keep pipe trenches free of water during pipelaying operations in accordance with Section 31 03 33 – Removal and Control of Water.

B. Install pipe to line and grade as shown on drawings and approved laying diagrams.

C. Joining HDPE Pressure Pipe:
1. Make heat fusion joints in accordance with ASTM F2620.
2. Pipe may be joined above ground and then lowered into position, provided pipe and joint is supported and handled in a manner that prevents damage.
3. Do not join fabricated fittings larger than 16 inch diameter to more than one pipe before placement in trench.

D. Connections between HDPE Pressure Pipe pressure pipe and other types of pipe:
1. Flange joints or as shown on drawings.
2. Make all connections per approved submittals.

E. HDPE Pressure Pipe Fusion Machine Data Loggers:
1. Used during joint heat fusions.
2. Record:
   a. Pipe size and DR to be joined,
   b. Fusion temperature,
   c. Interface pressure,
   d. Cooling time,
   e. Name of operator performing the joint fusion,
   f. Date and time each joint was made,
   g. Other data points as recommended by heat fusion joint machine manufacturer.

F. Schedule work so that at no time will pipe remain in the trench more than 7 days before backfill is placed to original ground surface or to other specified backfill limits shown on drawings.

G. Plowing and planting: Not allowed.

3.04 ADJUSTMENTS IN ALIGNMENT AND GRADE

A. Changes in alignment and grade:

1. Where shown as miter bends on drawings exceeding 15 degrees, make changes in alignment and grade with fabricated miter bends. Submit proposal for all fabricated miter bends to COR for approval.
2. Make other adjustments for bends equal to or less than 15 degrees in alignment and grade by bending pipe. Do not exceed manufacturer's deflection tolerances.
   a. Minimum cold (field) bend radius shown in Table 33 11 18A – Minimum Cold Bending Radius.

Table 33 11 18A – Minimum Cold Bending Radius

Pipe DR	Minimum Cold Bending Radius
>21	30 times pipe OD
Fitting or flange present or to be installed in bend	100 times pipe OD

B. After pipelaying and joining operations are completed, flush inside of pipe and remove debris.

C. Closure sections:
   1. Last heat fusion joint for HDPE Pressure Pipe to HDPE Pressure Pipe closure sections:
      a. Make during the coolest part of the day.
      b. Air temperature, maximum: 65 degrees F.

3.05 BEDDING AND EMBEDMENT

A. Install bedding and embedment materials as follows:
   1. Only one material shall be used for the length of the pipe, unless otherwise approved by COR.
   2. Select material shall be in accordance with requirements of this section, at locations shown on the drawings.
   3. Controlled Low Strength Material (CLSM) shall be in accordance with Section 31 23 70 – Controlled Low Strength Material (CLSM) at locations shown on the drawings.

3.06 BACKFILL

A. Backfill pipe in accordance with Section 31 23 11 – Earthwork for Pipe and Structures at locations shown on the drawings:

1. In certain pipeline reaches, where determined necessary by the COR to prevent the possibility of flotation, do not lay more than 300 linear feet of pipe ahead of backfilling operations.

3.07 THRUST RESTRAINT

A. Concrete thrust restraint blocking is required when select material is used for pipe bedding and embedment. Blocking is not required when using CLSM for pipe bedding and embedment.

1. If used, concrete thrust restraint blocking shall be at locations shown on the drawings, in accordance with Section 03 30 00 – Cast-in-Place Concrete.

3.08 CONNECTION AT STRUCTURES

A. Connect pipe to structures as shown on drawings.

3.09 TOLERANCES

A. Lay pipe to lines and grades shown on drawings, unless otherwise established by the COR to the following tolerances:

1. Departure from and return to established alignment and grade, maximum: 1/16 inch per foot of pipe.
2. Total departure from established alignment and grade, maximum:
   a. Vertical: 1 inch.
   b. Horizontal: 3-inches.

3.10 PIPE DIAMETER DEFLECTION

A. Measure initial deflections in pipe as defined in this section.

B. Allowable short-term vertical pipe diameter deflection after backfilling is complete:

1. Decrease, maximum: 3 percent of nominal pipe diameter.
2. Elongation, maximum: 3 percent of nominal pipe diameter.

C. Measurement frequency:

1. Once every 50 feet for the first 500 feet of backfilled pipe, and once every 200 feet thereafter unless otherwise directed by COR.
2. In areas of deep burial or where special problems are encountered, the frequency of measurements may be increased at the discretion of the COR.

D. Measurements:

1. Measure vertical and horizontal diameter at approximate midpoint of pipe unit.

2. Record pipe deflections and station or coordinates where measurements were taken.
3. Permanently mark inside of pipe so that future comparisons can be made as needed.

E. Deflection limits apply for any pipe section, regardless of segment or joints.

F. If pipe deflections exceeds allowable limits:
1. Take measurements upstream and downstream at 50 foot intervals to determine extent of excessive deflection, unless otherwise directed by COR.
2. Provide measurements to COR as soon as practical.
3. Additional direction, up to and including replacement, will be provided by COR to the Contractor after deflection data is analyzed.

3.11 PIPE FLUSHING

A. Flush pipe before filling for contractor field quality testing.

B. Water used for flushing shall not be provided from Icicle Creek, nor shall it be returned to Icicle Creek, discharged on project lands, or released into the Leavenworth National Fish Hatchery. Refer to Section 01 51 00 – Temporary Utilities.

C. Flush foreign material from pipe prior to testing.

D. Remove all debris from pipe before flushing.

E. Flush using a minimum velocity of 3 feet per second toward low points in reach.

F. Flush using a maximum of 3 pipe volume until water is clean, unless otherwise approved by COR.

G. Dispose of flush water in accordance with Section 01 57 30 – Water Pollution Control.

3.12 FILLING AND DRAINING PIPE

A. Notify COR 5 days before filling and testing.

B. Water for filling and testing pipe in accordance with Section 01 51 00 – Temporary Utilities.

C. Pipe fill rate, maximum: 4.5 cubic feet per second.

D. Maintain pipe completely filled for at least 24 hours, maximum before testing.

E. Drain pipe after testing is completed, unless otherwise directed by COR.

F. Dispose of testing water using approved method.

1. Used water shall not be returned to Icicle Creek, discharged on project lands, or released into the Leavenworth National Fish Hatchery.

3.13 CONTRACTOR FIELD QUALITY TESTING

A. Fusion Quality Testing on HDPE Pressure Pipe:

1. Frequency:

a. Minimum: 1 per crew per week or at request of COR.

b. Maximum: 10 percent of welds.

c. Additional testing may be required during changes in:

1) Weather.

2) Fusion machine.

3) Fusion crew.

4) Changed site conditions.

2. Procedure:

a. Cool trial fusion, then:

1) Cut out test coupons.

2) Test using Tensile Impact Method in accordance with ASTM F2634.

3. Rejection of Fusion Joints:

a. Exhibits a yield point lower than unfused pipe or,

b. Fails in brittle mode.

c. Field fusions represented by failed trial fusion shall be rejected:

1) Make corrections at Contractor's expense and re-make rejected fusions.

B. Leak testing pipe:

1. Notify the COR at least 5-days before applying pressure to pipeline.

2. Do not start leak testing when snow or standing water is on the ground. Suspend testing as directed by COR if precipitation accumulates on the ground.

3. Provide pumps, power, pressure gauges, and calibrated flowmeters for testing.

4. Test pipeline with hydrostatic pressure equal to 1,190 feet.

5. Maintain pressure for 24 hours before starting leakage measurement.

6. Measure volume of water required to maintain pressure during test.

a. Acceptance criteria:

1) Measured leakage shall not be greater than the test allowance prescribed the following test method:

a) ASTM F2164.

b. If leakage rate is exceeded, halt test and identify and repair leaks as approved by COR.

c. Repeat test until leakage rate is not exceeded.

7. Repair detectable leak, regardless of leakage rate.

C. Locate tracer wire:

1. Perform test of tracer wire system using applicable equipment along entire length of pipe to ensure proper performance.

2. Repair any identified breaks or separations and retest applicable section of system.

END OF SECTION

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DIVISION 34 – NOT USED

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DIVISION 35 - WATERWAY AND MARINE CONSTRUCTION

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SECTION 35 21 95
STEEL PIPING

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Steel Piping:

1. Payment: Lump sum prices offered in the Price Schedule.

1.02 DEFINITIONS

A. Steel Piping:

1. Details of steel piping are shown on drawings 222-D-60365 through 222-D-60367 and 40-D-7018.

1.03 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)

1.	ASME B1.20.1-2013(R2018)	Pipe Threads, General Purpose (Inch)
2.	ASME B16.11-2021	Forged Fittings, Socket-Welding and Threaded
3.	ASME B16.9-2018	Factory Made Wrought Buttwelding Fittings

B. ASTM International (ASTM)

1.	ASTM A36/A36M-19	Carbon Structural Steel
2.	ASTM A53/A53M-24	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
3.	ASTM A105/A105M-24	Carbon Steel Forgings for Piping Applications
4.	ASTM A139/A139M-22	Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
5.	ASTM A1011/A1011M-23	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength Steel
6.	ASTM A1018/A1018M-23a	Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with

		Improved Formability, and Ultra-High Strength
7.	ASTM D1785-21a	Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
8.	ASTM A420/A420M-24	Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low Temperature Service
9.	ASTM D2564-20	Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
10.	ASTM E165/E165M-23	Liquid Penetrant Examination for General Industry
11.	ASTM E709/E709M-21	Guide for Magnetic Particle Testing

C. American Welding Society (AWS)

1.	AWS D1.1/D1.1M:2020	Structural Welding Code - Steel

D. American Water Works Association (AWWA)

1.	AWWA C200-17	Steel Water Pipe - 6 In (150 mm) and Larger
2.	AWWA C206-23	Field Welding of Steel Water Pipe
3.	AWWA C207-18	Steel Pipe Flanges for Waterworks Service, Sizes 4 In. through 144 In. (100 mm Through 3,600 mm)
4.	AWWA C208-22	Dimensions for Fabricated Steel Water Pipe Fittings
5.	AWWA C227-22	Bolted, Split-Sleeve Couplings
6.	AWWA C604-17	Installation of Buried Steel Water Pipe – 4 In. (100 mm) and Larger
7.	AWWA C606-15	Grooved and Shouldered Joints

E. Commercial Item Descriptions (CID)

1.	CID-A-A-1923A-01	Shield Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittals.

B. RSN 35 21 95-1, Shop Drawings:

1. Checked, detailed shop drawings including dimensions and tolerances, material data, joint details, and welding requirements:

a. Provide checked box on each drawing indicating date drawing was checked and by whom.

C. RSN 35 21 95-2, Commercial Products Data:

1. Pipe couplings.
2. Gaskets.

D. RSN 35 21 95-3, Pipe Installation Procedure:

1. Methods for maintaining circularity and preventing damage to steel pipe, fittings, lining and coating during loading, transporting, unloading, storing, and laying.
2. Type and location of pipe supports and tie downs to be used.
3. Methods for ensuring pipe alignment.
4. Type, locations, and details of field welds.
5. Installation procedure to be performed in conjunction specifications section 02 41 10 – Selective Site Demolition.

E. RSN 35 21 95-4, Field Weld Test Results:

1. Results of air and soap tests on field welded double lap and butt strap joints.

F. RSN 35 21 95-5, Final Drawings:

1. Complete set of As-Built drawings
   a. Clearly mark drawings 222-D-60365 through 222-D- 60367 to show all field modifications of the final installation.
   b. Submit drawings in accordance with Section 01 78 30 – Project Record Documents.

1.05 QUALIFICATIONS

A. Welders and Welding Operators to be qualified in accordance with AWWA C200.

1.06 DELIVERY, STORAGE, AND HANDLING

A. During loading, transporting, unloading, storing, and laying, prevent damage to steel piping linings and coating. Transport and handle in accordance with fabricator's instructions:

1. Provide padded bolsters curved to fit under outside of pipe.
2. Provide heavy padding under ties during transportation and storage.

B. Maintain circularity of pipe sections during coating, lining, transporting, and installing operations:

1. Provide stulls or adjustable spiders.

2. Measured deviation between maximum and minimum diameters at stulls or spiders shall not exceed 0.5 percent of nominal pipe diameter.

C. Do not store directly on the ground.

D. Store so that lifting straps can be passed beneath pipe sections.

E. Provide space to allow personnel to move between pipe sections.

F. Cover with tarps and tie down securely.

G. Repair damage to lining and coating as directed if, in the opinion of COR, a satisfactory repair can be made; otherwise, replace damaged section at the expense of the Contractor and in accordance with Section 09 96 20 – Coatings.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Steel plate:

1. ASTM A36, ASTM A1011, Grade 36, 40, or 45; or ASTM A1018, Grade 36 or 40.

B. Standard and schedule steel pipe:

1. ASTM A53, Type E or S, Grade B:

a. Pipe 4-inches in diameter and smaller: Galvanized.

b. Pipe larger than 4-inches in diameter: In accordance with Section 09 96 20 – Coatings.

C. Electric–fusion– (arc–) welded, spiral–seam steel pipe:

1. ASTM A139, Grade C, D, or E.

D. Non-metallic pipe:

1. Polyvinyl chloride (PVC) ASTM D1785.

E. Flanges:

1. Steel: Slip-on ring type.

2. Flat faced: AWWA C207.

3. Flat face with finish suitable for gasket:

a. Provide spiral or concentric serrated grooved flange face gasket surface finishes that are suitable for the flat gasket material provided and for the operating pressures.

F. Gaskets:

1. Suitable for cold potable water.
2. Use Multi-Swell Style 3760-U manufactured by Garlock, www.garlock.com; or equal, having the following essential characteristics:
   a. Dimensional requirements of AWWA C207.
   b. Flat, full face type.
   c. Minimum 20 psi cold water pressure rating.
   d. Minimum 1/16-inch thick.

G. Flange bolts:

1. Compatible with AWWA C207 flanges. Threaded steel fittings:
   a. ASME B16.11 and ASTM A105.
   b. Threaded NPT: ASME B1.20.1.

H. Pipe couplings:

1. Steel:
   a. Grooved-end: Style 77 or Style W77 manufactured by Victaulic, www.victaulic.com; or equal, having the following essential characteristics:
      1) AWWA C606.
      2) Rigid joint type with rolled grooves.
      3) Minimum cold water working pressure ratings:
         a) 150 psi.
   b. Restrained flexible type Style 232, manufactured by Victaulic, www.victaulic.com; or equal, having the following essential characteristics:
      1) Coupling type as shown on the drawings.
      2) Minimum cold water working pressure ratings:
         a) 50 psi.
      3) Conforms to AWWA C227.
      4) Steel material.
      5) Coupling housing: Arched, 2 or more segmented, split sleeve-type which when closed compresses elastomeric O-ring gaskets beneath arches of sleeve to create radial seal around pipe ends joined inside of coupling.
      6) Gaskets: Suitable for cold-water service.

I. Butt-Welding Steel Fittings:

1. ASME B16.9 and ASTM A234 or ASTM A420 - WPL6.

J. Steel Pipe Reducers: Designed, fabricated and dimensioned in accordance with AWWA C208.

K. Steel Pipe Miter Bend Elbows and Fittings: Designed, fabricated, and dimensioned in accordance with AWWA C208.

L. Anchor bolts:

1. Expansion anchors or epoxy type anchor bolts with studs and epoxy as shown on the drawings:

a. Expansion anchors:

1) CID A-A-1923A, Type 4.

2.02 FABRICATION

A. Fabricate steel piping in accordance with these specifications, as indicated on drawings, and in accordance with AWWA C200.

B. Longitudinal, girth, and spiral joints, other than field welds:

1. Double-welded butt joints with complete penetration.
2. Stagger longitudinal joints.
3. Longitudinal, girth, and spiral joints shall not intersect at outlet connections.

C. Cut plates accurately to size and shape.

D. Bend or roll plates to true circular with curvature continuous from edges of plates.

E. Properly form edges to be joined by welding to suit type of welding and to allow complete penetration.

F. Perform welding with a process that protects molten metal from atmosphere:

1. Where practicable, use automatic machines.
2. Where weld metal is deposited in successive layers, clean each layer thoroughly before subsequent layer is deposited.
3. Take particular care in aligning and separating edges of plates to be joined by butt welding so that complete penetration and fusion of welds will be ensured.
4. After welding is complete, remove weld spatter.

G. Protect work and operator from wind, rain, and snow during welding operations:

1. Welding is not permitted on wet surfaces or when temperature of steel is lower than 0 degrees F.
2. Apply heat to welding areas as needed during field installation. At pipe surface temperatures between 0 and 32 degrees F, heat surface of areas within 3-inches of the point where a weld is to be started to at least 60 degrees F.

H. Ends to be joined by a pipe coupling:

1. Exterior surface of pipe end to be connected with sleeve-type coupling shall be free from weld reinforcement (bead), seams, scars, dents, flats, or other defects likely to interfere with joint-sealing process in accordance with coupling manufacturer instructions.

I. Flanges and flanged connections:

1. During attachment of flanges to associated steel pipe, take adequate steps to ensure that face of flanges remains flat and perpendicular to centerline of attached piping.
2. Limit irregularities or warping in face of flanges to 0.0015 of an inch measured from:
   a. A high point on face of flange at an inside diameter to a corresponding low point on face of flange at an outside diameter, along a radial line, (concave orientation of flange is not permissible) and,
   b. A high point on face of flange along a circumferential line at centerline of flange bolt holes, to a low point on face of flange along same circumferential line, within a distance equal to circumferential distance between every third bolt hole.
3. Remove by machining, initial, residual, or latent irregularities or warping that remains in face of flange after its attachment to steel piping that exceeds the above.
4. After machining, flange thickness shall not be reduced below minimum thickness specified in AWWA C207.
5. Weld pipe flanges to the piping so that bolt holes straddle vertical centerline when in the installed position.
6. Provide pipe flanges that connect to valve body flanges with same number of bolt holes, bolt pattern, bolt circle diameter, and face type, flat or raised, as valves to which they are connected.

J. Continuously weld joints of flange supports and pipe supports.

K. Solvent weld PVC socket type pipe fittings to PVC pipe using ASTM D2564 solvent and method in accordance with ASTM D2855:

1. Do not subject solvent welded joints to internal or external loads or pressures until the solvent is fully cured.

2.03 CONTRACTOR SOURCE QUALITY TESTING

A. Flange Weld and Fixed Pipe Supports Testing:

1. Test flange and Fixed Pipe Supports welds by magnetic particle or liquid penetrant method in accordance with AWS D1.1.
2. Repair defects and retest weld.

B. Coupling Restraint Ring Weld Testing:

1. Test welds of restraint rings welded to pipe for split-sleeve restrained couplings by magnetic particle or liquid penetrant method in accordance with AWS D1.1.
2. Repair defects and retest weld.

C. Hydrostatic Pressure Testing:

1. Straight sections of metal piping manufactured and hydrostatically tested in accordance with ASTM A53 or ASTM A139 need not be retested.
2. Notify Government a minimum of 30-days before test.
3. Government may witness hydrostatic test and calibration of pressure gauges.
4. Use 2 or more pressure gauges with one being a recording type:
   a. Upper limit of pressure gauges shall be between 1.5 and 3 times required test pressure. Calibrate pressure gauges with a deadweight tester.
   b. Calibrate at least 1 gauge, which is used for acceptance of test, within 30-days prior to use.
   c. Make a time-pressure record of hydrostatic pressure test.
5. Furnish temporary supports, bulkheads, air vents, dead weight tester, and other equipment necessary to perform hydrostatic tests.
6. If flange is attached to piping section after piping section has been hydrostatically tested, piping section will not require retesting.
7. Water temperature for tests: Greater than 45 degrees F.
8. Vent air from test sections.
9. Fill each section with water and uniformly increase pressure until required test pressure is reached:
   a. Hydrostatic test pressure = 50 psig
   b. Hold test pressure for a minimum of 15-minutes.
   c. Apply and release test pressure 3 successive times.
   d. After each application, hold pressure to 2/3 of required pressure until welded joints and seams can be examined.

e. Repair defects. After defects are repaired repeat complete test procedure.

10. After hydrostatic testing is completed, cut sections for handling purposes on planes normal to pipe axis.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install steel piping to line and grade as shown on drawings:

1. Install steel pipe in accordance with the approved Pipe Installation Procedure.

B. Furnish and install supports and bracing as may be required to hold steel piping in place, prevent distortion, and prevent flotation during erection, placing of concrete. Supports and bracing shall bear against the exterior pipe surface a minimum of 120-degrees of the pipe circumference and not create a point load on the pipe:

1. Embedment of timber supports will not be permitted.
2. If used for the support system, cables or chains may not bear directly against the steel pipe or concrete reinforcement.

C. Contact between pipe and rebar will not be allowed.

D. Install pipe spools with flanged connections so that bolt holes straddle vertical centerline when in installed position.

E. Dielectrically insulate between dissimilar metals:

1. Provide insulating type unions at threaded valve, pipe or fitting connections between dissimilar metals.

F. Install pipe couplings, gaskets, and other appurtenances in accordance with manufacturer instructions.

G. Install anchor bolts in accordance with manufacturer instructions.

H. Ends of existing pipeline and new pipe to be connected with a pipe coupling:

1. The exterior surface of the pipe end to be connected with the pipe coupling: free from weld reinforcement (bead), seams, scars, dents, flats, or other defects likely to interfere with the joint-sealing process in accordance with coupling manufacturer instructions.
2. Clean the face and body of the existing flange that is to be connected to the new flange. Ensure that the existing flange face has adequate finish for the new gasket.

3.02 CONTRACTOR FIELD QUALITY TESTING

A. Nondestructive Testing of Field Welds of Steel Pipe:

1. Test all welds in accordance with AWWA C206 and this specification.
2. Complete inspections and tests as work progresses in presence of COR and in accordance with AWS D1.1.
3. When welds are found to be defective by the standards of AWS, repair welds in accordance with AWS D1.1 and reexamine welds to ensure the adequacy of repairs.
4. Visual Inspection: Visually inspect all welds following procedures, techniques, and standards of AWS D1.1.
5. Testing of full penetration joints:
   a. Ultrasonic methods in accordance with AWS D1.1.
6. Testing of partial penetration joint field welds and fillet field welds, including testing of double welded butt strap joints or double welded lap joints:
   a. Magnetic particle testing: ASTM E709.
   b. Dye penetrant: ASTM E165.
   c. Standards of acceptance for both types: AWS D1.1.
   d. Caulking or peening of defective welds is not permitted.
   e. Repair and retest unsatisfactory welds.
7. Coupling Restraint Ring Weld Testing:
   a. Test welds of restraint rings welded to pipe for split-sleeve restrained couplings by magnetic particle or liquid penetrant method in accordance with AWS D1.1.
   b. Repair defects and retest weld.

3.03 LINING AND COATING

A. Refer to Section 09 96 20 – Coatings.

END OF SECTION

SECTION 35 22 14
VALVES AND EQUIPMENT

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Knife Gate Valve:

1. Measurement: Number of Knife Gate Valves installed.
2. Payment: Unit Price offered in the Price Schedule:
   a. Includes knife gate valves, and associated installation hardware.

B. Valves and Equipment:

1. Payment: Lump-sum prices offered in the Price Schedule for various types, sizes of valves, and equipment provided, as shown on drawings.
   a. Does not include Knife Gate Valve.

1.02 DEFINITIONS

A. Details of valves and equipment are shown on drawings: 222-D-60365 through 222-D-60367.

1.03 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME)

1. ASME B40.100-2022 — Pressure Gauges and Gauge Attachments

B. American Water Works Association (AWWA)

1. AWWA C207-18 — Steel Pipe Flanges for Waterworks Service, Sizes 4 In. through 144 In.
2. AWWA C512-15 — Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
3. AWWA C520-14 — Knife Gate Valves, 2” (50 mm) Through 96” (2400 mm)

C. Manufacturers Standardization Society of the Valves and Fittings Industry (MSS)

1. MSS SP-110-2010 — Ball Valves Threaded, Socket–Welding, Solder Joint, Grooved, and Flared Ends

D. National Electrical Manufacturing Association Standards (NEMA)

1. NEMA ICS 5-2017 — Industrial Control and Systems: Control Circuit and Pilot Devices
2. NEMA MG 1-2021 — Motors and Generators
3. NEMA 250-2020 — Enclosures for Electrical Equipment (1,000 Volts Maximum)

E. National Fire Protection Association (NFPA)

1. NFPA 70-2020 — National Electric Code (NEC)

1.04 SUBMITTALS

A. Submit the following in accordance with the requirements of Sections 01 33 00 – Submittals and 01 33 26 – Electrical Drawings and Data.

B. RSN 35 22 14–1, Commercial Products Data:

1. Pressure gauges.
2. Manually operated ball valves.
3. Air valves.
4. Motor-Operated Knife Gate Valve Data:
   a. Commercial products (catalog) data including:
      1) Manufacturer's name.
      2) Model number.
      3) Bill of material.
      4) Name plate list.
      5) Settings for the limit switches and the torque switches.
   b. Torque calculations showing that the motor operator is of sufficient size to seat or unseat the valve and hold the valve at any intermediate position under the maximum unbalanced pressure conditions.
   c. Valve data:
      1) Maximum torque required (foot-pounds).
      2) Test data of rated flow coefficient (Cv). Provide data in graph or table format with data points at a maximum of 10 degree intervals, for disk angles of 10 degree through 90 degree.
   d. Motor data:
      1) Locked rotor torque (foot-pounds).
      2) Full load torque (foot-pounds).
      3) Horsepower rating (horsepower).

4) Voltage rating (volts).

5) Locked rotor amps (amperes).

6) Full load amps (amperes).

7) Time duty rating (minutes).

8) Assembly drawings.

9) Schematic and wiring diagrams for each motor operated ball valve:

a) Show terminal and connection details specific to this project for all connections to the motor operated actuator and contractor supplied components.

b) Clearly mark the interface for remote devices.

c) Show designations on device terminals and wire numbers.

d) Show spare contacts.

5. Valve insulation jackets:

a. Provide calculations demonstrating insulation material is adequate to prevent freezing from generally accepted seasonal extreme temperatures at the location being installed for a duration of 30 hours at normal operating capacity.

C. RSN 35 22 14-2, Check Prints – Valve Actuator:

1. In accordance with section 01 33 26 – Electrical Drawings and Data.

D. RSN 35 22 14–3, Shop Testing Certifications and Reports:

1. Hydrostatic pressure testing certifications and pressures used in testing valves:

a. Knife Gate Valve.

2. Reports of valve operation with motor-operators at working pressure:

a. Knife Gate Valve.

E. RSN 35 22 14–4, Service Manuals:

1. For each valve and equipment type listed below, include:

a. Complete parts identification lists including clearly identified recommended spare parts.

b. Lists of special tools and accessories.

c. Detailed instructions for installing, adjusting, operating, lubricating, and maintaining the equipment.

2. Manuals for the following:

a. Pressure gauges.

b. Ball valves with manual actuators.

c. Motor-Operated Knife Gate Valve:

1) Final "As-built" drawings, including:

a) Schematics and wiring diagrams.

b) Catalog data sheets for each device or item of equipment.

c) Half-size prints of drawings including nameplate list and bill of material.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Take precaution during loading, transportation, unloading, storage, and laying, to prevent damage to the valves and equipment:

1. Repair damage to the valves and equipment as directed if, in the opinion of COR, a satisfactory repair can be made; otherwise replace damaged valves and equipment.

2. Ship, handle and store according to manufacturer's instructions.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Pressure Gauges:

1. Model 213.40 manufactured by Wika Instrument, LP, www.wika.us, Type 1279 manufactured by Ashcroft, Inc. www.ashcroft.com; or equal, having the following essential characteristics:

a. Range displayed: 0 psi to 25 psi in increments of 0.5 psi.

2. Bronze bourdon-tube, adjustable-movement type:

a. Case material: Brass, aluminum alloy, phenolic or stainless-steel.

b. Dust-proof and moisture-proof case.

c. Glycerin liquid filled.

d. 4-inch to 4 1/2-inch diameter or larger dial.

e. Dial: White with black markings.

f. Black indicating pointer.

g. Red maximum reading pointer indicating highest pressure attained.

h. Shatter resistant window.

i. Conform to ASME B40.100, Grade A accuracy or better.

j. Bottom connects to 0.25-inch diameter male pipe connection.

B. Manually Operated Ball Valves:

1. Less than 4-inches in diameter:

a. Threaded connections:

1) 76F-100-A series manufactured by Apollo Valves https://aalberts-ips.us/; or equal, having the following essential characteristics:

a) Bubble tight at the rated pressure in either direction and suitable for operation after long periods of inactivity.

b) MSS SP–110.

c) Body: Full ported, carbon steel or stainless-steel as shown on the drawings.

d) Ball: Stainless-steel.

e) Valve stem: Stainless-steel.

f) Packing gland: Stainless-steel.

g) Female threaded ends.

h) Cold water pressure rating of not less than 150 psi.

C. Air Valves:

1. General:

a. AWWA C512.

b. Cold water service.

c. Single or dual body.

d. Stainless-steel internal parts such as guides, bushings, and screws.

e. Stainless-steel floats.

f. Float-pivot supports: Brass, bronze, stainless-steel, or cast iron.

g. Spare parts:

1) One complete set of air valve spare parts for each size and type including:

a) Seats, lever, and gasket.

b) Additional parts recommended by manufacturer.

c) Box and clearly label box:

i. Include detailed list of spare parts inside box.

d) Store in location as determined by COR.

2. Combination air valves:

a. Remains open for filling line until water has displaced air at point of attachment of valve assembly after which it closes.

b. Opens when pressure in pipeline drops sufficiently to create a vacuum.

c. Releases trapped air when the pipeline is under pressure.

d. Furnish with ball valves in accordance with paragraph 2.01 B.:

1) One ball valve on top, permits checking effectiveness of air valve.

2) One ball valve on bottom, allows valve to be drained.

3) For dual body valves, provide full port isolation ball valve between main body and air release valve.

D. Motor-Operated Knife Gate Valve:

1. General:

a. Provide valves which are bubbletight at the rated pressure and suitable for operation after long periods of inactivity.

b. Install valves complete and lubricated in accordance with the manufacturer's instructions.

c. Mark the valve body with a flow arrow which indicates the manufacturer's recommended flow direction through the valve.

d. Suitable for exposed service inside the vault as shown on the drawings.

e. A warranty for the valve shall apply for a period of 2 years after installation is complete.

2. Valve Body Flange Faces and Flanges:

a. Valve manufacturers are responsible for providing the correct flange face gasket surface finish.

b. Provide spiral or concentric serrated grooved flange face gasket surface finishes that are suitable for the gasket material provided and for the operating pressures.

c. Valve flange bolt patterns to match pipe flanges.

3. Model (Figure) F-193 by Mueller/Pratt Valves, 675 Mitchell Ave., Woodland, WA 98674, Canada; Model KGC BY Hilton/DeZurik Valves, Kirkland, WA 98083; or equal, having the following essential characteristics.

a. Tested in accordance with AWWA C520.

b. 36-inch diameter, one-way flow.

c. Fabricated square bottom body with carbon steel flanges and gussets.

d. 304 Stainless steel liner and raised faces

e. 304 Stainless steel square bottom gate with knife-edge.

f. Complete with electric motor-operated actuator suitable for modulating operation, see below.

g. Cold water pressure design: 50 psig.

h. Flanges drilled and tapped to ASME B16.47/1996 Class 150, Series A, suitable for bolting to AWWA Class D flanges.

i. Ductile iron or cast steel body. Painted in accordance with these specifications.

j. Fabricated fully rated enclosed bonnet, 304 SS wetted parts

k. 304 SS metal to metal seat with UHMW wear strip and Buna-N O-ring resilient seat for uni-directional drip-tight shut-off.

l. 304 SS V-port insert as shown on the drawings.

m. Complete with flow deflector on the inlet side.

n. UHMW gate wiper.

o. TLSP packing rated to 500 deg F, 3-11 PH.

p. Fabricated carbon steel packing gland with 304 SS bolts.

q. Carbon steel yoke.

r. 304 SS rising stem.

s. Stem backseat with EPDM seal to allow for repacking under pressure when the valve is in the fully open position.

t. Automatically maintain a desired flowrate value input into the control system that incorporates data from the existing flowmeter.

4. Valve Operating Conditions:

a. Maximum inlet pressure: 11.00 psig (24 feet of head).

b. Minimum inlet pressure: 6.10 psig (14 feet of head).

c. Maximum outlet pressure: 3.00 psig (6.5 feet of head).

d. Minimum outlet pressure: 3.00 psig (6.5 feet of head).

e. Flow rate range: 0 to 42.0 cubic feet per second.

f. Elevation of valve centerline: 1141.35 feet.

g. Valve Opening/Closing time: 300 seconds.

h. The valve shall operate as specified in Section 26 24 20 – Control Boards.

E. Motor-Operators:

1. Manufactured by, AUMA Actuators, Inc., www.auma.com, Rotork Controls, www.rotork.com, Flowserve (Limitorque), www.flowserve.com, Emerson (EIM), www.emerson.com; or equal, having the following essential characteristics:

1) Valve Opening/Closing time: 300 seconds minimum for preventing transients during operation.

a) Tolerance: +30 seconds

b. AWWA C542.

c. Motor-operators shall be from same manufacturer.

d. Service: Open, close, and modulation control.

e. Motor to supply at least two times the torque required to open and close the valves under maximum full differential pressure.

f. Control power supplied and transformed internally from the primary power connection, supplied at 3-phase, 480 V, 60 Hz from panel DP2.

g. Enclosure:

1) Encloses control switches and buttons so they are inaccessible.

2) Keyed lock to prevent unauthorized operation.

3) NEMA 250 type 4X enclosure for electrical equipment.

h. Reduction gears.

i. Mechanical position indicator.

j. Electric motor:

1) Suitable for operation at provided project conditions per Section 01 14 10 – Use of Site.

2) Induction type rated 480 volts, 3 phase, 60 hertz, conforming to NEMA MG 1 and designed for required service.

3) Enclosure: Totally-enclosed, fan-cooled (TEFC).

4) Minimum time rating: 15-minutes.

5) Designed for full-voltage starting and reversing duty.

6) Locked-rotor torque: Not less than 250 percent of full-load torque.

7) Insulation: Class F or H.

k. Integral motor starter:

1) Full-voltage, reversing type with mechanical and electrical interlocks.

2) Coils: 480 volts, 60-hertz.

3) Provide with thermal overload device. Thermal protector integral with motor may be used in lieu of motor starter overload device.

l. Torque switch mechanism:

1) Integral part of motor operator which functions to protect valve and motor operator in opening and closing directions.

2) Independently adjustable for both travel directions.

m. Limit switches:

1) Integral part of motor actuator and furnished with necessary gearing.

2) Provide with minimum of four independent limit switches set to function as follows:

a) Two electrically independent contacts – Close at fully-open position.

b) Two electrically independent contacts – Close at fully-closed position.

3) Heavy-duty type.

4) Adjustable to operate at any valve position.

5) Contacts rated for a minimum of 1 amp at 120 VAC.

n. Handwheel:

1) Provide a handwheel for manual operation that does not rotate during motor operation.

2) Failure of the motor shall not prevent manual operation.

3) Provide a declutching mechanism to engage the handwheel for manual operation.

o. Display:

1) Digital LED display with valve status and valve position indication.

a) Units: Inches and/or percent open.

b) Resolution: 1/100 inch and/or 1 percent.

2) Display height, minimum: 0.3 inch.

3) Location: At pushbuttons and/or rotary switch and easily visible.

p. Local User Interface:

1) Accessible from outside the enclosure.

2) OPEN-CLOSE Control switch or push buttons.

3) LOCAL-STOP-REMOTE control switch.

q. Remote Control Interface:

1) Minimum control datapoints available via the Modbus communication link.

a) OPEN

b) CLOSE

c) STOP

d) VALVE POSITION (in percent)

e) BLOCK OPERATION

2) Provide Modbus communication capability via Modbus TCP/IP with RJ-45 connection or Modbus RTU with RS-485 connection.

r. Provide anti-condensation heater:

1) Thermostatically controlled, anti-condensation heater.

2) 120 volts, 60 Hz, energized internally from the electric actuator control circuit.

s. Provide terminal blocks for terminating external cables:

1) Provide terminal blocks for terminating external cables.

2) Suitable for connection to SCADA system.

t. Position Transducer:

1) Output signal with the gate in the fully-closed position, minimum: 4 milliamperes.

2) Suitable for continuous operation.

u. Mounting options:

1) Mount motor operators for valves with ball valve bodies.

2) Axis of shafts for valves shall be orientated as recommended by Manufacturer.

v. Digital Control Module (DCM):

1) Provide gate actuator with DCM to allow for remote monitoring and control of the actuator.

2) Microprocessor based electronics with control software stored in non-volatile EEPROM memory.

3) Watchdog timer to disconnect actuator from network and disable outputs upon microprocessor failure. Two serial communication ports, minimum.

4) Built in transient and lightning protection.

5) Perform self-diagnostics.

6) Provide valve position feedback in the form of 0 to 100 percent of valve opening.

7) Provide following status and alarms, minimum:

a) Valve in fully open position.

b) Valve in fully closed position.

c) Valve is moving in open direction in both electric and handwheel mode.

d) Valve is moving in closed direction in both electric and handwheel mode.

e) Torque switch tripped in the OPEN direction.

f) Torque switch tripped in the CLOSE direction.

g) Valve is not moving on command.

h) Loss of internal control voltage.

i) Actuator failed self-diagnostics or general alarm

8) Communication:

a) Communication protocol: Modbus RTU.

b) Communication method: Single RS-485 twisted pair, shielded wire network.

w. Integral disconnect switches:

1) Single throw switch.

2) Rating: 480V, 30 A

3) Equip operator handles with means for padlocking operator in either open or closed position.

4) Position of disconnect switch shall be marked OPEN or CLOSED.

x. Power Connection:

1) Provide new circuit breaker, located at DP2 panel, to supply the motor actuator. Design and provide all necessary cables, raceway and accessory components required for power connection

2) In accordance with NFPA 70.

F. Valve Insulation Jackets:

1. Manufactured by ThermaXX LLC, 16 Hamilton Street, West Haven CT 06516; or equal, having the following essential characteristics:

a. Provide the knife gate valve and the air valve with an insulation jacket.

b. Insulation material should be adequate to prevent freezing from generally accepted temperatures at location being installed.

c. Non-asbestos.

d. Hydrophobic.

e. R-value: As required by calculations. Minimum R-10.

f. Removable.

2.02 CONTRACTOR SOURCE QUALITY TESTING

A. Shop test AWWA knife gate valve in accordance with AWWA C520:

1. Leak test valves in both directions and hydrostatically test valves at manufacturer's facility or an alternate facility approved by COR.
2. Tests will be Government witnessed. Notify COR 30-days prior to valve testing.
3. Minimize number of Government trips by testing all valves from same manufacturer during same Government trip.
4. Prior to shop leakage test and in presence of Government, Contractor shall verify that when valve is fully closed, valve position indicator indicates, "CLOSED".
5. If indicator is not in closed position (exactly at closed), remove operator from valve, fully close valve, reinstall operator so that it indicates, "CLOSED".

PART 3 EXECUTION

3.01 INSTALLATION

A. Install the valves and equipment to line and grade as shown on drawings.

B. Install valves with flanged connections so that the bolt holes straddle the vertical centerline when in the installed position.

C. Install valves and gaskets in accordance with the manufacturer's instructions.

3.02 CONTRACTOR FIELD QUALITY TESTING

A. Field testing:

1. Coordinate with the knife gate valve manufacturer to provide a factory trained service technician for start-up and/or training.
2. After each valve has been completely installed, test valve in steel manifold by opening and closing valve through full range of operation 3 times.
3. Operational Test:
   a. With valves fully assembled and installed and the motor-operators electrically connected and adjusted.
      1) Operate each valve through at least three full cycles using the motor operator.
      2) Set position indicator to show exact open and closed positions of valve.

3) Open and close valve using handwheel in both directions.

4) Return to motor-operator operation and demonstrate valve operation to move valve at least one full cycle to verify proper return to motor operation.

b. Record:

1) Valve opening and closing times.

2) Valve travel speed.

3) Voltages and amperages required to open and close the valve.

4) Observations and conclusions.

4. Verify accurate outputs from valve actuator open/close limit switches and valve position transducer feedback.

5. Make changes or adjustments until operation is approved by COR, and valves are bubbletight and do not leak water past seats.

6. Valves have zero allowable leakage.

3.03 COATINGS

A. Coat valves and equipment in accordance with Section 09 96 20 – Coatings.

END OF SECTION

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DIVISIONS 40 THROUGH 48 – NOT USED

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DIVISION 51 – INFORMATION AVAILABLE TO OFFERORS

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SECTION 51 00 00
INFORMATION AVAILABLE TO OFFERORS

PART 1 GENERAL

1.01 ORDER OF PRECEDENCE

A. In case of differences between sections in Division 51 - Information Available to Offerors and sections in other divisions of the specifications, the requirements in the other divisions will govern.

B. The Government assumes no responsibility for deductions, interpretations, or conclusions made by the Contractor based on information made available by the Government, in accordance with the clause at FAR 52.236-3, Site Investigation and Conditions Affecting the Work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

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SECTION 51 00 30
INADVERTENT DISCOVERY PLAN

PART 1 GENERAL

1.01 INADVERTENT DISCOVERY PLAN

Leavenworth NFH – SWISP Project
Chelan County, Washington
Township 24 North, Range 17 East, Sections 23, 26 and 27, Leavenworth USGS Quad

Plan and Procedures for the
Inadvertent Discovery of
Cultural Resources and Human Remains

1. INTRODUCTION

The following Inadvertent Discovery Plan (IDP) outlines procedures to perform in the event of discovering archaeological materials or human remains, in accordance with federal and state laws.

2. RECOGNIZING CULTURAL RESOURCES

A cultural resource discovery could be prehistoric or historic. Examples include:

a. An accumulation of shell, burned rocks, or other food related materials.
b. Bones or small pieces of bone.
c. An area of charcoal or very dark stained soil with artifacts.
d. Stone tools or waste flakes (i.e. an arrowhead or stone chips).
e. Clusters of tin cans or bottles, wood pipes, agricultural equipment that appears to be older than 50 years.

When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

STEP 1: *Stop Work*. If any employee, contractor or subcontractor believes that he or she has uncovered a cultural resource at any point in the project, all work must stop immediately. Notify the appropriate party(s). Leave the surrounding area untouched and provide a demarcation adequate to provide the total security, protection, and integrity of the discovery. The discovery location must be secured at all times by a temporary fence or other onsite security.

STEP 2: *Notify* the Bureau of Reclamation (USBR) Archaeologist.

Columbia-Cascades Area Office Archaeologist
Mary Velazquez
Office: 509-573-8022
mvelazquez@usbr.gov

STEP 3: *Notify* the Project Manager of this project

The Project Manager or applicable staff will make all calls and necessary notifications. **If human remains are encountered**, treat them with dignity and respect at all times. Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed. Do not call 911 or speak with the media. Do not take pictures unless directed to do so by the USBR Archaeologist or the Washington DAHP. See Section 5.

4. FURTHER CONTACTS AND CONSULTATION

A. Project Manager's Responsibilities:

• *Protect Find*: The Project Manager is responsible for taking appropriate steps to protect the discovery site. All work will stop immediately in a surrounding area adequate to provide for the complete security of location, protection, and integrity of the resource. Vehicles, equipment, and unauthorized personnel will not be permitted to traverse the discovery site. Work in the immediate area will not resume until treatment of the discovery has been completed following provisions for treating archaeological/cultural material as set forth in this document.
• *Direct Construction Elsewhere On-Site*: The Project Manager may direct construction away from cultural resources to work in other areas prior to contacting the concerned parties.

B. Senior Staff Responsibilities:

• *Identify Find*: The USBR Archaeologist or a designee will ensure that a qualified professional archaeologist examines the area to determine if there is an archaeological find.

o If it is determined not to be of archaeological, historical, or human remains, work may proceed with no further delay.

o If it is determined to be an archaeological find, the USBR Archaeologist or a designee will continue with all notifications.

o If the find may be human remains or funerary objects, USBR Archaeologist or designee will ensure that a qualified physical anthropologist examines the find. If it is determined to be human remains, the procedure described in Section 5 will be followed.

• *Notify DAHP*: The USBR Archaeologist or designee will contact the Washington Department of Archaeology and Historic Preservation (DAHP).

Department of Archaeology and Historic Preservation	Dr. Allyson Brooks	360-586-3066
Department of Archaeology and Historic Preservation	Guy Tasa (State Physical Anthropologist)	(360) 586-3065 (360) 790-1633

• *Notify Tribes*: If the discovery may be of interest to Native American Tribes, the USBR Archaeologist or designee will notify and coordinate with the interested and/or affected tribes.

Tribes consulted on this project are:

Confederated Tribes of the Colville Reservation	Guy Moura (Tribal Historic Preservation Officer)	(509) 634-2695
Confederated Tribes and Bands of the Yakama Nation	Jerry Meninick (Deputy Director, Cultural Resource Program)	(509) 865-5121 Ext. 4714

Further Activities
• Archaeological discoveries will be documented as described in Section 6.
• Construction in the discovery area may resume as described in Section 7.

5. **SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL** Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Do not take photographs by any means, unless you are pre-approved to do so.

The provisions of the Native American Graves Protection and Repatriation Act of 1990 apply on federal lands associated with this project, and the Bureau of Reclamation will follow its provisions.

If the project occurs on the non-federal lands portion of the project, the Project Manager will comply with applicable state and federal laws, and the following procedure:

A. In all cases you must notify a law enforcement agency or Medical Examiner/Coroner's Office:
In addition to the actions described in Sections 3 and 4, the Project Manager will immediately notify the local law enforcement agency.
The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human, whether the discovery site constitutes a crime scene, and will then notify DAHP.

Chelan County Sheriff's Department - Leavenworth 509-663-9911

B. Jurisdiction on Private Lands: Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains discovered on private lands associated with this project.

B. **Further Activities on Private Lands**:

• Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.

• When consultation and documentation activities are complete, construction in the discovery area may resume as described in Section 7.

6. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological deposits discovered during construction will be assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The USBR Archaeologist or designee will ensure the proper documentation and field assessment will be made of any discovered cultural resources in cooperation with all parties: the federal agencies, DAHP, and affected tribes.

All prehistoric and historic cultural material discovered during project construction will be recorded by a professional archaeologist on a cultural resource site or isolate form using standard and approved techniques. Site overviews, features, and artifacts will be photographed; stratigraphic profiles and soil/sediment descriptions will be prepared for minimal subsurface exposures. Discovery locations will be documented on scaled site plans and site location maps.

Cultural features, horizons and artifacts detected in buried sediments may require further evaluation using hand-dug test units. Units may be dug in controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. A test excavation unit or small trench might also be used to determine if an intact occupation surface is present. Test units will be used only when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. Excavations will be conducted using state-of-the-art techniques for controlling provenience, and the chronology of ownership, custody and location recorded with precision.

Spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock will be recorded for each probe on a standard form. Test excavation units will be recorded on

unit-level forms, which include plan maps for each excavated level, and material type, number, and vertical provenience (depth below surface and stratum association where applicable) for all artifacts recovered from the level. A stratigraphic profile will be drawn for at least one wall of each test excavation unit.

Sediments excavated for purposes of cultural resources investigation will be screened through 1/8-inch mesh, unless soil conditions warrant ¼-inch mesh.

All prehistoric and historic artifacts collected from the surface and from probes and excavation units will be analyzed, catalogued, and temporarily curated. Ultimate disposition of cultural materials will be determined in consultation with the federal agencies, DAHP and the affected tribes.

Within 90 days of concluding fieldwork, a technical report describing any and all monitoring and resultant archaeological excavations will be provided to the Bureau of Reclamation, DAHP, and the affected tribe(s).

If assessment activity exposes human remains (burials, isolated teeth, or bones), the process described in Section 5 will be followed.

7. PROCEEDING WITH WORK

Work outside the discovery location may continue while documentation and assessment of the cultural resources proceed. A professional archaeologist must determine the boundaries of the discovery location. Section 106 consultation and associated federal laws will make the final determinations about treatment and documentation.

Work may continue at the discovery location only after the process outlined in this plan is followed and the USBR Archaeologist or designee, DAHP, and affected tribes, determine that compliance with state and federal law is complete.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

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DIVISION 52 - DRAWINGS

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SECTION 52 00 00
DRAWINGS

PART 1 GENERAL

1.01 DISCREPANCIES, ERRORS, OR OMISSIONS

A. Inform the CO of discrepancies discovered on drawings in accordance with clause at FAR 52.236-21, Specifications and Drawings for Construction.

B. In accordance with clause at FAR 52.236-21, Specifications and Drawings for Construction, in case of discrepancies, written specifications take precedence over drawings unless otherwise specified.

1.02 PROJECT CONDITIONS

A. Where there are differences as determined by the CO between details and dimensions shown on drawings and details and dimensions of existing features at jobsite, use details and dimensions of existing features at jobsite.

1.03 INFORMATION DRAWINGS

A. Drawings marked "For Information Only" in the drawing list are included to show existing features about which knowledge is required to perform work under this contract. These drawings do not show work to be performed under this contract.

B. If there are differences as determined by the CO between details and dimensions shown on these drawings and those of existing features at jobsite, use details and dimensions of existing features at jobsite.

1.04 STANDARD DRAWINGS

A. Standard drawings may show details which are not a part of work under this contract. Disregard details shown on these drawings which are not applicable to work under this contract.

1.05 COPIES OF DRAWINGS

A. One set of full-size (22 inches by 34 inches) drawings, except standard drawings, will be furnished to the Contractor.

B. Upon request, additional half-size (11 inches by 17 inches) copies of standard drawings will be furnished to the Contractor.

1.06 LIST OF DRAWINGS

A. Drawings listed in Table 52 00 00A - List of Drawings are made a part of Section C - Description/Specifications.

1.07 DRAWING NUMBERS IN NUMERICAL ORDER

A. Specification drawings are listed in numerical order in Table 52 00 00B - Drawings in Numerical Order.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

Table 52 00 00A - List of Drawings

Sheet No.	Drawing No.	Title
General:		
1	222-D-60346	Key Map, Location Map, Site Map
2	222-D-60347-Rev 1	Partial Site Plans and Details
Civil:		
3	222-D-60348	Structural CIPP Relining – Site Plan – CIPP Pipe Relining
4	222-D-60349	Structural CIPP Relining – Partial Site Plans – Contractor Use Areas – Sheet 1 of 2
5	222-D-60350	Structural CIPP Relining – Partial Site Plans – Contractor Use Areas – Sheet 2 of 2
6	222-D-60351	Connection to Existing Pipe – Plan and Section
7	222-D-60352	Structural CIPP Relining – Partial Site Plans – Contractor Use Area Access Roads
8	222-D-60353	Structural CIPP Relining – Partial Site Plans – Contractor Use Area Access Roads
9	222-D-60354	Plan and Profile - Sta. 48+00.00 to Sta. 64+82.62

Table 52 00 00A - List of Drawings

Sheet No.	Drawing No.	Title
10	222-D-60355-Rev 1	Native Material Pipe Trenches - Sections and Details
11	222-D-60356	CLSM Pipe Trenches – Typical Sections and Details
12	222-D-60357	Concrete Thrust Block – Plan and Section
Structural:		
13	222-D-60359	Control Valve Vault – Structural Design Data - General
14	222-D-60360	Control Valve Vault – Plans and General Notes
15	222-D-60361	Control Valve Vault –Sections
Mechanical:		
16	222-D-60365	Steel Piping and Valves - Plans
17	222-D-60366	Steel Piping and Valves – Section and Detail
18	222-D-60367	Steel Piping and Valves – Section and Details
Electrical:		
19	222-D-60369	Control Valve Vault – Electrical Networking Diagram
20	222-D-60370	Control Valve Vault – Electrical Single Line Diagram
Information Drawings:		
21	1F-WA-257A-33.0	Icicle Creek Pipeline – Plan and Profile
22	1F-WA-257A-36.1	Icicle Creek Pipeline – Plan, Profile & Sections
23	1F-WA-257A-124-1.0	Settling Basin – Hatchery Plot Plan
24	1F-WA-257A-124-2.0	Settling Basin – Site Plan and Details
25	1F-WA-257A-124-3.0	Settling Basin – Site Details
26	1F-WA-257A-124-4.0	Settling Basin – Plan and Section
27	1F-WA-38-25.0	Fish Cultural Station Screen Chamber – Piping Modification
28	222-D-60264	Parking and Turn Around Areas – Sheet 2 of 2
29	222-D-60269	Intake Pipeline – Plan and Profile
30	222-D-60270	Intake Pipeline – Plans, Profiles and Detail

Table 52 00 00A - List of Drawings

Sheet No.	Drawing No.	Title
31	222-D-60313	Pipe Diameters – Cross Sections
32	3712-100-161	Water Pipe Inspection – Location Map
33	3712-100-162	Water Pipe Inspection – Site Plan
34	3712-100-163	Water Pipe Inspection – Pipeline Plan
35	3712-100-164	Water Pipe Inspection – Pipeline Plan
36	3712-100-165	Water Pipe Inspection – Manhole and Pipe Saddle Details
37	3712-100-166	Water Pipe Inspection – Culvert Sections
38	3712-100-167	Water Pipe Inspection – Access Road Plan
39	3712-100-168	Water Pipe Inspection – Temporary Water System – Plan and Profile
40	3712-100-169	Water Pipe Inspection – Screen Chamber Building – Section and Detail
Standard Drawings:		
41	40-D-4334	Electrical Installation - Typical Grounding Details
42	40-D-4335	Electrical Installation - Typical Grounding Details
43	40-D-4753	Electrical Installation - Typical Grounding Details For Switchyards and Substations
44	40-D-5246	Buildings - Method of Building Forms for Successive Lifts
45	40-D-5247	Buildings - Joints in Concrete Structures
46	40-D-5370	Switchyards and Substations – Electrical Installation – Buried Insulated Cables – Typical Details
47	40-D-60001	Electrical Equipment Support, Type 1 – Sections and Detail
48	40-D-60003	General Notes for Concrete Outline and Reinforcement
49	40-D-60004	Minimum Requirements for Detailing Reinforcement
50	40-D-6182	Electrical Installation - Typical Cable Trench Grounding

Table 52 00 00A - List of Drawings

Sheet No.	Drawing No.	Title
51	40-D-6234	Standard Nameplates
52	40-D-6551	Pressure Pipe - Trench Installation - Select Material
53	40-D-6552	Pressure Pipe - Trench Installation - Soil-Cement Slurry - 12 inch and Larger Pipe
54	40-D-6576	Switchyards and Substations – Electrical Installation – Buried Conduit – For Low Voltage Cables
55	40-D-6601	Miscellaneous Metalwork – Ladder -Type 2
56	40-D-7012	General Concrete Outline Notes
57	40-D-7018	Flange Support
58	40-D-7094	Electrical Installation – Conduit Clamp and Conduit Supports – Typical Details
59	40-D-7102	Government Drawing Format - Drawing Border, Sample Title Block and Signature Lines
60	104-D-757	Pumping Plant - Electrical Installations - Designations and Symbols
61	104-D-1150	Major Power/Pumping Plants - Electrical Installation - Device Designations and Symbols to be Used on Single-Line and Schematic Diagrams
62	104-D-1165	Typical Powerplant/Pumping Plant – Electrical Installation – Main Control Board CSA – Panel 7R – Wiring Diagram

Table 52 00 00B – Drawings
Numberical Order

Drawing No.	Sheet No.
222-D-	
222-D-60264	28
222-D-60269	29
222-D-60270	30

Table 52 00 00B – Drawings
Numberical Order

Drawing No.	Sheet No.
222-D-60313	31
222-D-60346	1
222-D-60347-Rev-1	2
222-D-60348	3
222-D-60349	4
222-D-60350	5
222-D-60351	6
222-D-60352	7
222-D-60353	8
222-D-60354	9
222-D-60355-Rev 1	10
222-D-60356	11
222-D-60357	12
222-D-60359	13
222-D-60360	14
222-D-60361	15
222-D-60365	16
222-D-60366	17
222-D-60367	18
222-D-60369	19
222-D-60370	20
3712-100-	
3712-100-161	32
3712-100-162	33
3712-100-163	34
3712-100-164	35

Table 52 00 00B – Drawings
Numberical Order

Drawing No.	Sheet No.
3712-100-165	36
3712-100-166	37
3712-100-167	38
3712-100-168	39
3712-100-169	40
1F-WA-	
1F-WA-257A-33.0	21
1F-WA-257A-36.1	22
1F-WA-257A-124-1.0	23
1F-WA-257A-124-2.0	24
1F-WA-257A-124-3.0	25
1F-WA-257A-124-4.0	26
1F-WA-38-25.0	27
40-D-	
40-D-4334	41
40-D-4335	42
40-D-4753	43
40-D-5246	44
40-D-5247	45
40-D-5370	46
40-D-6182	50
40-D-6234	51
40-D-6551	52
40-D-6552	53
40-D-6576	54
40-D-6601	55

Table 52 00 00B – Drawings
Numberical Order

Drawing No.	Sheet No.
40-D-7012	56
40-D-7018	57
40-D-7094	58
40-D-7102	59
40-D-60001	47
40-D-60003	48
40-D-60004	49
104-D-	
104-D-757	60
104-D-1150	61
104-D-1165	62

END OF SECTION

DIVISION 53 – GEOLOGIC INVESTIGATIONS AND RECORDS

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SECTION 53 10 00
GEOLOGIC INVESTIGATIONS

PART 1 GENERAL

1.01 GENERAL

A. General

1. Geologic descriptions, drawings, logs of subsurface explorations, water level data, and test data in these specifications include information and records of geologic investigations for the work and are geologic data upon which the design of this work is based. These data supersede previous versions which may be available for examination by Offerors. These data are contained in Section 53 20 00 - Records of Geologic and Subsurface Investigations.

2. Selected samples recovered during investigations were tested by TSC CGSL laboratories in Denver Colorado. Summaries of Physical Properties Test Results from laboratory tests performed on these samples are contained in Section 53 20 00 - Records of Geologic and Subsurface Investigations. Offerors are encouraged to inspect the site and to obtain their own samples and perform tests on the materials to evaluate properties which the Offeror believes to be significant. Samples are available for examination at TSC CGSL in Denver Colorado. Offerors wishing to inspect the samples, visit the site, or take samples at the site should make arrangements with Nicole Ahlem at Columbia-Cascades Area Office (CCAO), (509) 406-5864.

3. Copies of the following reports and memoranda on the area, site geology, and materials properties may be examined at Columbia-Cascades Area Office (CCAO), 1917 Marsh Road, Yakima, WA 98901. Offerors wishing to inspect the reports and memoranda should make arrangements with Nicole Ahlem at (509) 406-5864.

   a. Geologic Report – Design Data Level Investigations for Improvements at the Leavenworth National Fish Hatchery, Columbia Basin Project, Washington, Bureau of Reclamation, Boise, Idaho, November 2009.

   b. Geologic Data Package for Final Design of the Surface Water Intake, Leavenworth National Fish Hatchery, Washington, Columbia Basin Project, Bureau of Reclamation, Boise, Idaho, May 2020.

   c. Geologic Data Package for Final Design of the Surface Water Intake Pipeline, Leavenworth National Fish Hatchery, Washington, Columbia Basin Project, Bureau of Reclamation, Boise, Idaho, October 2020.

   d. Technical Memorandum 85-832000-2020-08 – Geophysical Surveys: OBI/ABI/FWS Borehole Logging and 2D Magnetic Mapping,

Leavenworth Fish Hatchery Water Supply Project, Leavenworth WA, Bureau of Reclamation, Denver, Colorado, April 2020.

e. Technical Memorandum 85-832000-2020-14 – Geophysical Surveys: 2D Seismic P-wave Refraction Tomography profiling, Leavenworth Fish Hatchery Intake and Pipeline, Leavenworth WA, Bureau of Reclamation, Denver, Colorado, September 2020.

f. Technical Memorandum No. 8550-2020-07, Geotechnical Characterization of Granodiorite from Leavenworth National Fish Hatchery, Washington, Bureau of Reclamation, Denver, Colorado, April 2020.

g. Technical Memorandum No. 8550-2021-01, Leavenworth National Fish Hatchery Phase II Geotechnical Laboratory and Field Investigation, Washington, Bureau of Reclamation, Denver, Colorado, January 2021.

4. The geologic logs of test pits and drill holes, downhole televiewer, geologic surface mapping, geologic surface geophysics refraction survey, water-level data, and other available geologic information indicate the conditions encountered during the investigations. The water-level data show the conditions at the particular time or times the information was obtained and may not indicate variations such as those caused by drought, precipitation, changes in the surface elevation of nearby reservoirs, irrigation, or flooding.

5. The geologic drawings portray generalized geologic conditions. The geologic logs of explorations should be consulted for specific details. For General Geologic Legend, Explanation, and Notes, refer to the appropriate 2020 Geology Reports.

6. General geologic unit definitions, explanations of geologic symbols, and geologic notes are described in the 2020 Geology Reports.

7. Surface geology and location of explorations, cross sections, and note drawings for the work are included in these specifications in the 2020 Geology Reports.

8. Overburden materials recorded in geologic exploration logs included in these Specifications were classified under current Unified Soil Classification System procedures as described in USBR 5000 (laboratory classification) and USBR 5005 (visual classification). These two procedures are similar to ASTM D 2487 and ASTM D 2488, respectively.

9. Reclamation has established standard descriptors and descriptive criteria for rock and standard descriptors and descriptive criteria for discontinuities. These standards are available for review at Columbia-Cascades Area Office, Yakima WA. The standards provide the basis for classification and description of rock and discontinuities logged after September 1984.

1.02 REFERENCE STANDARDS

A. ASTM International (ATSM)

1. ASTM D 2487-11 — Classification of Soils for Engineering Purposes (Unified Soil Classification)
2. ASTM D 2488-09a — Description and Identification of Soils (Visual-Manual Procedure)

B. Bureau of Reclamation (USBR)

1. USBR EM – Earth Manual, Part 2, Third Edition (1990)
2. Procedure No. and Title
   a. USBR 5000-86 — Determining Unified Soil Classification (Laboratory Method)
   b. USBR 5005-86 — Determining Unified Soil Classification (Visual Method)
   c. Copies of the above Reclamation procedures are available for review at Columbia-Cascades Area Office (CCAO).

1.03 GEOLOGIC INVESTIGATIONS

A. Geologic investigations conducted at Leavenworth National Fish Hatchery are listed below; and available logs and drawings of investigations are contained in Section 53 20 00 - Records of Geologic and Subsurface Investigations.

1. Preconstruction test pits and drill holes were conducted between 1936 and 1938 by Reclamation.
2. Reconnaissance-level geologic assessment was conducted in 2009 downstream of the intake structure by Reclamation and summarized in report “Site Visit to Leavenworth National Fish Hatchery, Leavenworth, WA.”
3. Seven drill holes with four observation wells were drilled downstream of the intake structure using compressed air in order to verify bedrock conditions. Additionally, twelve out of nineteen test pits were excavated downstream of the intake structure to determine properties of the foundation and overburden materials. Drilling and test pit logs are in Appendix A of the 2009 Report entitled, “ Design Data Level Investigations for Improvements at the Leavenworth National Fish Hatchery, Pacific Northwest Region, Boise, ID, Reclamation.”
4. In the fall of 2019, one borehole with downhole full-wave sonic and optical televiewer and geologic surface mapping was conducted by Reclamation around the existing intake structure and gate house.

5. In the summer of 2020, two dimensional p-wave seismic refraction surveys were performed along the proposed alignment of the pipeline to be replaced. In addition, surveys were conducted along the proposed access roadway alignment to delineate thickness of overburden materials and depth to bedrock. Results of these surveys provided proxy information for estimating ripability of any rock and interpretation to depth of bedrock.

6. In July of 2020, six test pits were excavated along the approximate 1,800 feet of pipeline located immediately upstream of the fish hatchery's sediment stilling basin. Test pits were excavated to approximately 8 feet below ground surface and geologically logged for changes in soil types. Additionally, ring density tests were conducted at the bottom of each test pit in order to evaluate the total unit weight and dry unit weight of the foundation materials that the new pipeline will be founded.

1.04 REGIONAL GEOLOGY

A. Leavenworth National Fish Hatchery is located within the Stuart Mountain Batholith. The dominant rock type is granodiorite, which is intermediate between quartz diorite and tonalite. The host rock for the batholith is a highly metamorphosed and complex group of older sedimentary rocks (Reclamation 2006). The north-south trending Leavenworth Fault is a high-angle fault with the downthrown block to the east and is not known to be active (Tabor et al. 1987).

The area is characterized by alpine glaciation of the region. Glacial drift on the slopes consists largely of till and on the valley floors consists of outwash sand, gravel, and cobbles grading down the valley from moraines. Outburst flood deposits were laid down in the upper surfaces near the mouth of Icicle Creek canyon during the last glaciation (Tabor et al. 1987).

1.05 SITE GEOLOGY

A. The project area is underlain by intrusive bedrock of the Stuart Mountain Batholith covered by Pleistocene-age to recent surface deposits of glacial drift (Qgd), Colluvium (Qc) and Icicle Creek alluvium (Qal). Along the alignment of the existing pipeline is Fill (F).

Fill (F) consists primarily of material excavated from the local area for use in the construction of roads, parking surfaces, structures, and the existing pipeline backfill. This material is primarily derived from glacial outwash materials and alluvium deposited by Icicle Creek. It is composed of approximately 60 percent sand, 20 percent silt, and 20 percent gravel and was encountered in all test pits along the existing pipeline.

Quaternary Alluvium (Qal) are presumed to be glacial outwash materials reworked and sorted by Icicle Creek. The alluvium is distinguished from the glacial drift based on grain

size: the alluvium is generally finer-grained and consists mostly of medium to fine sand overbank deposits adjacent to Icicle Creek. This unit varied between test pts with some stratification noted, but is mostly classified as being homogenous Poorly-Graded Sand with Grave (SP)g or Silty-Sand with Gravel (SM)g. In all test pits, the material was light brown, loosely compacted, and had no reaction to hydrochloric acid.

Quaternary Colluvium is inferred to be derived from landslide and raveling of slope materials from the steep-side canyon walls. Materials are likely poorly graded sands, gravels, cobbles, and boulders up to tens of feet in diameter. This material is found along the river banks within the canyon, near the pipeline intake.

Quaternary glacial drift (Qgd) is comprised of glacial outburst flood deposits and outwash deposits. Quaternary glacial outwash deposits are located near the intake structure and consist of poorly sorted sand, gravel and cobbles with scattered boulders up to 2 feet in diameter.

Bedrock consists of the intrusive volcanic rocks of the Stuart Mountain Batholith (Kg) and comprises tonalite, granodiorite, diorite, and gabbro. This unit was not encountered along the 1,800 feet of pipeline directly upstream of the fish hatchery, but was encountered within the canyon, near the pipeline intake.

1.06 GROUNDWATER AND SEEPAGE

A. Sources of water that could enter excavations during construction are seepage from snow melt or rain through the surrounding bedrock of the canyon and from the river itself for any excavation below the local elevation of Icicle Creek. During the drilling of DH19-01 in November of 2019, groundwater was encountered approximately 18.5 feet below ground surface (~elevation 1199.5). In January of 2020, with a few inches of snow on the ground, groundwater was measured in DH19-01 approximately 8 to 10 feet below ground surface (elevation 1210 to 1208). We expect groundwater along the hillsides to be higher in the spring due to snow melt. During the July 2020 test pit excavations, no groundwater was encountered. The deepest test pit reached a total depth of 9.1 ft and was described as moist from 2.1 ft to 9.1 ft below ground surface.

1.07 ENGINEERING GEOLOGY AND GEOTECHNICAL CONSIDERATIONS

A. Excavation:

1. General surface stripping with bulldozers or front-end loaders will be sufficient to remove the loose soils.
2. Soils between approximate stations 48+00 and 65+68 are generally classified as Poorly-Graded Sand with Gravel (SP)g or Silty-Sand with Gravel (SM)g and have total unit weights between 142.2 lbf/ft^3 and 95.6 lbf/ ft^3. Soils contained less than 10% of cobbles up to 9 inches in diameter. Bedrock is not expected to be encountered between these stations. Seismic p-wave tomography results show

weathered bedrock as shallow as 20 feet below ground surface though this has not been confirmed with drilling.

3. Groundwater quality measures will need to be maintained in order to preserve the water quality of the river passing along the excavation. Because of the short flow path of groundwater at the excavation to the river, this will be necessary.

B. Slope Stability:

1. Excavations along approximate stations 48+00 and 65+68 will be on relatively level ground will require appropriate benching and back-sloping of excavation cuts to prevent sliding into excavations and to provide safe working environment.

C. Sloughing and Caving:

1. If overlying soil layers are not sufficiently stripped or stabilized during excavation, there could be risk of sloughing or shallow slope failure. Caving is not considered a risk.

D. Strength Properties:

1. Laboratory Testing of rock core from the 2019 borehole showed an average specific gravity of 2.74; unit weight of 174.2 pcf; uniaxial strength of 8,110 psf; and tensile strength of 508 psf.

2. Ring density results of test pit soils indicate total unit weights between 142.2 lfb/ft^3 and 95.6 lbf/ ft^3.

E. Borrow Materials:

1. Refer to Washington Department of Transportation requirements.

F. Liquefaction Potential:

1. Excavations will be within unsaturated soils and bedrock. Therefore, liquefaction potential is not a concern.

G. Water:

1. Depth to groundwater is anticipated to be near surface as the excavation may be recharged by Icicle Creek. Additionally, meteoric water from rain and snowmelt may enter the excavation, potentially recharging groundwater levels.

H. Drilling:

1. Drilling fluids should be contained and removed from the site in order to prevent contamination of the river.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

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SECTION 53 10 15
PHOTOGRAPHS OF GEOLOGIC INVESTIGATION TEST PITS

PART 1 GENERAL

1.01 TEST PIT PHOTOGRAPHS

A. The test pit photographs are provided.

Photo 1, TP-20-1 0.0-8.4 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 10 July, 2020

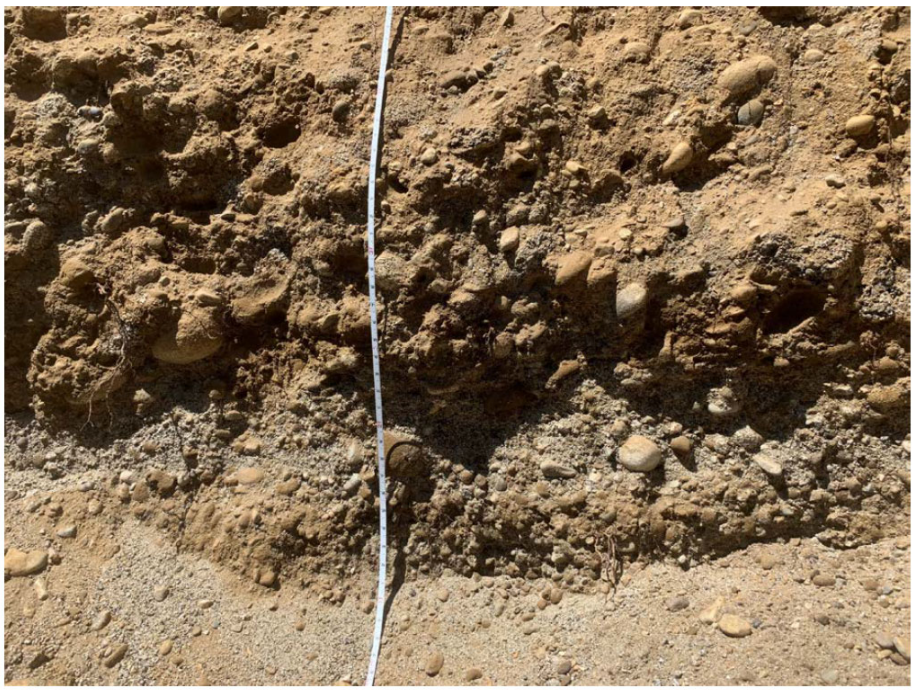

Photo 2, TP-20-1 0.5-4.0 ft, facing north, Leavenworth SWISP, Photo by A. Canner, 10 July 2020

Photo 3, TP-20-1 5.8-6.9 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 10 July 2020

Photo 4, TP-20-1 Stockpile, Leavenworth SWISP, Photo by A. Canner, 10 July 2020

Photo 5, TP-20-2 0.0-8.2 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 10 July 2020

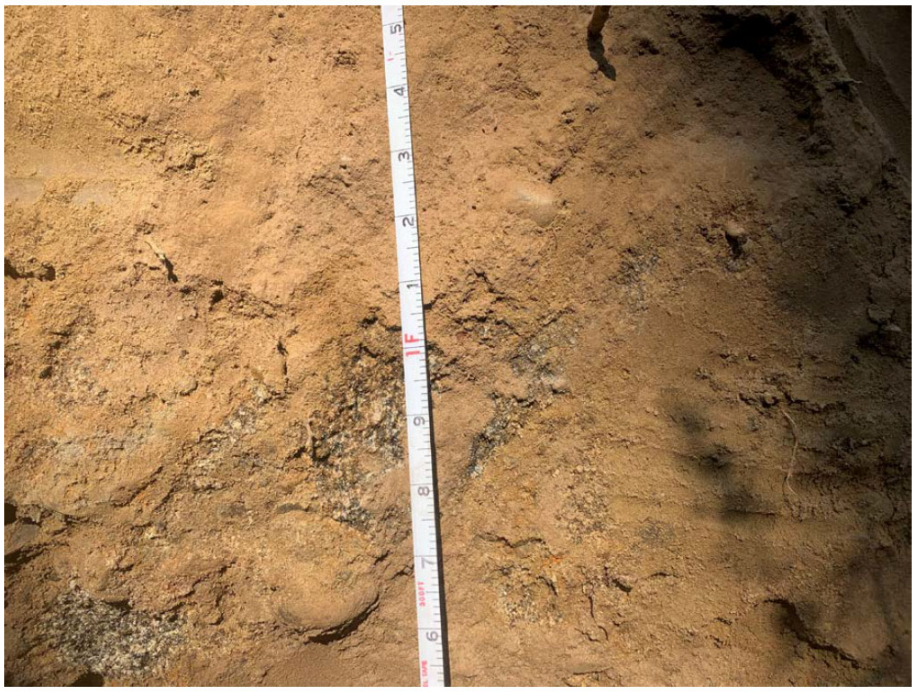

Photo 6, TP-20-2 6.7-7.7 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 10 July 2020

Photo 7, TP-20-2 stockpile, Leavenworth SWISP, Photo by A. Canner, 10 July 2020

Photo 8, TP-20-2 0.0-3.9 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 10 July 2020

Photo 9, TP-20-3 0.0-7.9 ft, facing south, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 10, TP-20-3 0.0-4.0 ft, facing east, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 11, TP-20-4 0.0-9.1 ft, facing southwest, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 12, TP-20-4 0.0-4.0 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 13, TP-20-4, contact with original wooden conduit, facing north, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 14, TP-20-4 stockpile, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 15, TP-20-5 0.0-8.1 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 16, TP-20-5 2.5-7.5 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 17, TP-20-5 6.2-6.9, facing east, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 18, TP-20-5 stockpile, Leavenworth SWISP, Photo by A. Canner, 09 July 2020

Photo 19, TP-20-6 0.0-8.2 ft, facing southwest, Leavenworth SWISP, Photo by A. Canner, 08 July 2020

Photo 20, TP-20-6 0.0-8.2 ft, facing west, Leavenworth SWISP, Photo by A. Canner, 08 July 2020

Photo 21, TP-20-6 stockpile, Leavenworth SWISP, Photo by A. Canner, 08 July 2020

Photo 22, TP-20-6, facing north, Leavenworth SWISP, Photo by A. Canner, 08 July 2020

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

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SECTION 53 20 00

RECORDS OF GEOLOGIC AND SUBSURFACE INVESTIGATIONS

PART 1 GENERAL

1.01 GEOLOGY DRAWINGS

A. Some drawings are in color to highlight geologic information. Geologic information shown on drawings is of equal importance regardless of whether or not it is highlighted.

Geology Drawings

Sheet No.	Drawing No.	Title
G1	103-D-347	Unified Soil Classification – Including Identification and Description

1.02 LABORATORY TEST DATA

Laboratory Test Data

Sheet No.	Title
Laboratory Test Data for Test Pits:	
G2	Test Pits TP-20-1 Through TP-20-6, Test Pit Locations and Profile (3712-100-60000)
G3	TP-20-1
G4	Particle Size Distribution Report – TP-20-1
G5	TP-20-2
G6	Particle Size Distribution Report – TP-20-2
G7	TP-20-3
G8	TP-20-4
G9	Particle Size Distribution Report – TP-20-4
G10	TP-20-5
G11	TP-20-6

Laboratory Test Data

Sheet No.	Title
G12	Particle Size Distribution Report – TP-20-6
G13	Table 1 – Ring Density Test Density Results

1.03 DATA AND LOGS

Geophysical Surveys

Sheet No.	Title
Downhill Geophysics Results:	
G14	Figure 13 – Geophysical Surveys: Phase II Seismic Tomography, LNFH Water Supply Project (Downstream Seismic Lines)
G15	Figure 14 – Geophysical Surveys: Phase II Seismic Tomography, LNFH Water Supply Project (Upstream Seismic Lines)

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION